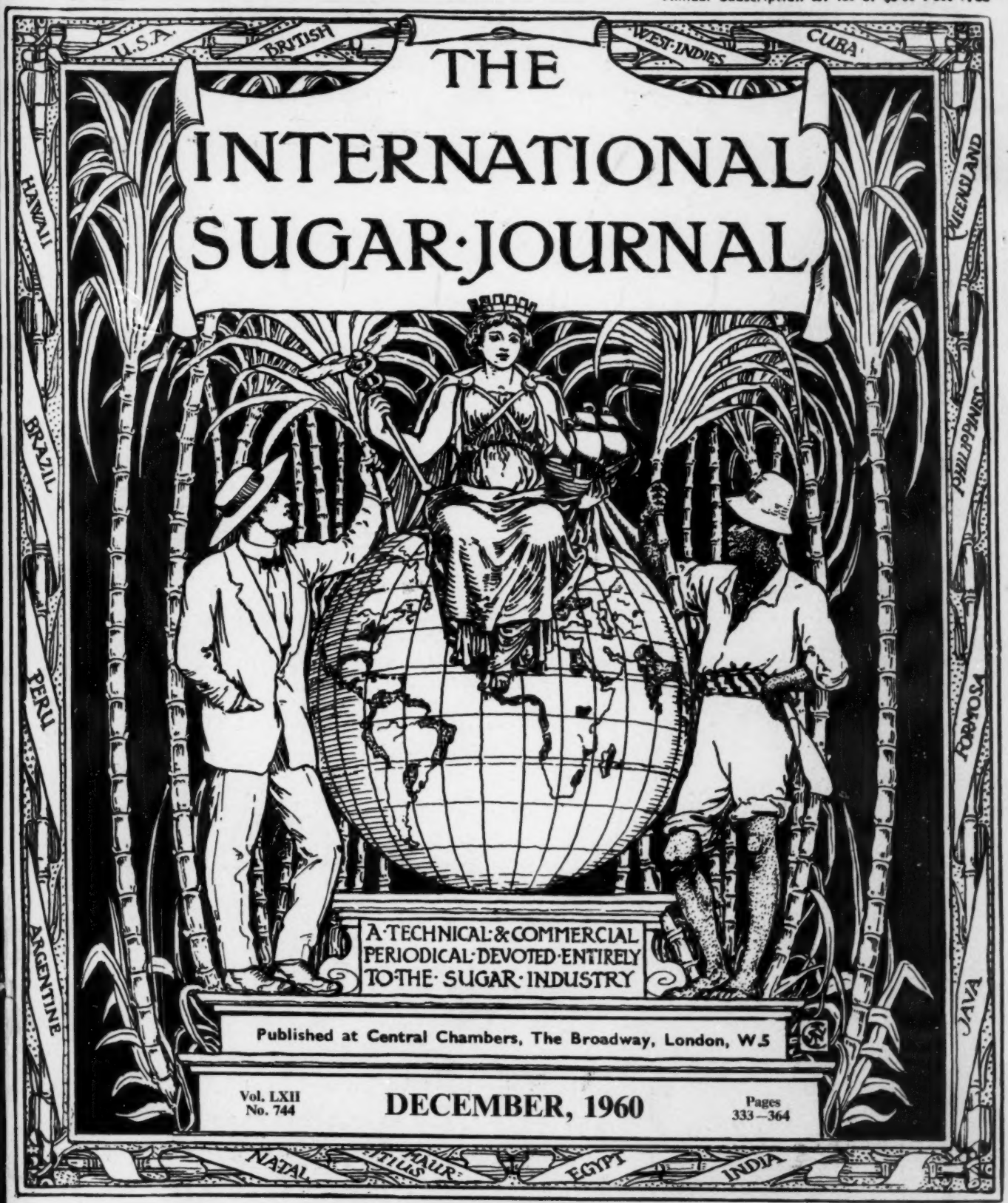
This Number contains the Index for 1960

2s 6d or 45 cents net
Annual Subscription £1 12s or $5·00 Post Free



THE INTERNATIONAL SUGAR JOURNAL

A TECHNICAL & COMMERCIAL PERIODICAL DEVOTED ENTIRELY TO THE SUGAR INDUSTRY

Published at Central Chambers, The Broadway, London, W.5

Vol. LXII
No. 744

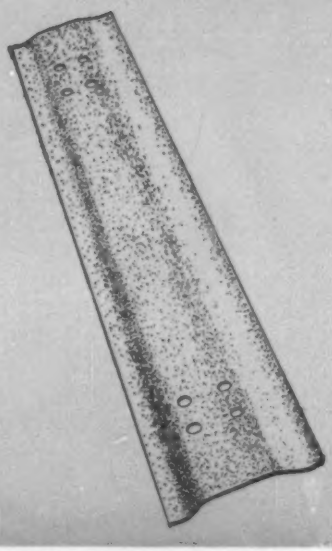
DECEMBER, 1960

Pages
333—364

For LIST OF ADVERTISERS see page lvi

cane carrier and intermediate carrier

SLATS



Mirrlees Slats combine strength with minimum weight.

CANE CARRIER SLATS

Can be supplied, double or triple corrugated, black or galvanised, and will suit any 6 in. pitch chain and 8 in. pitch chains in the larger sizes. Where dimensions are given, slats can be supplied holed for bolts or rivets.

INTERMEDIATE CARRIER SLATS

Manufactured in designs to suit the 900 and the 5,000 series of Inter Carrier Chains. The overlap is close and slats can be supplied Black or Galvanised and holed for fixing if desired.

CHAIN & SPROCKET WHEELS

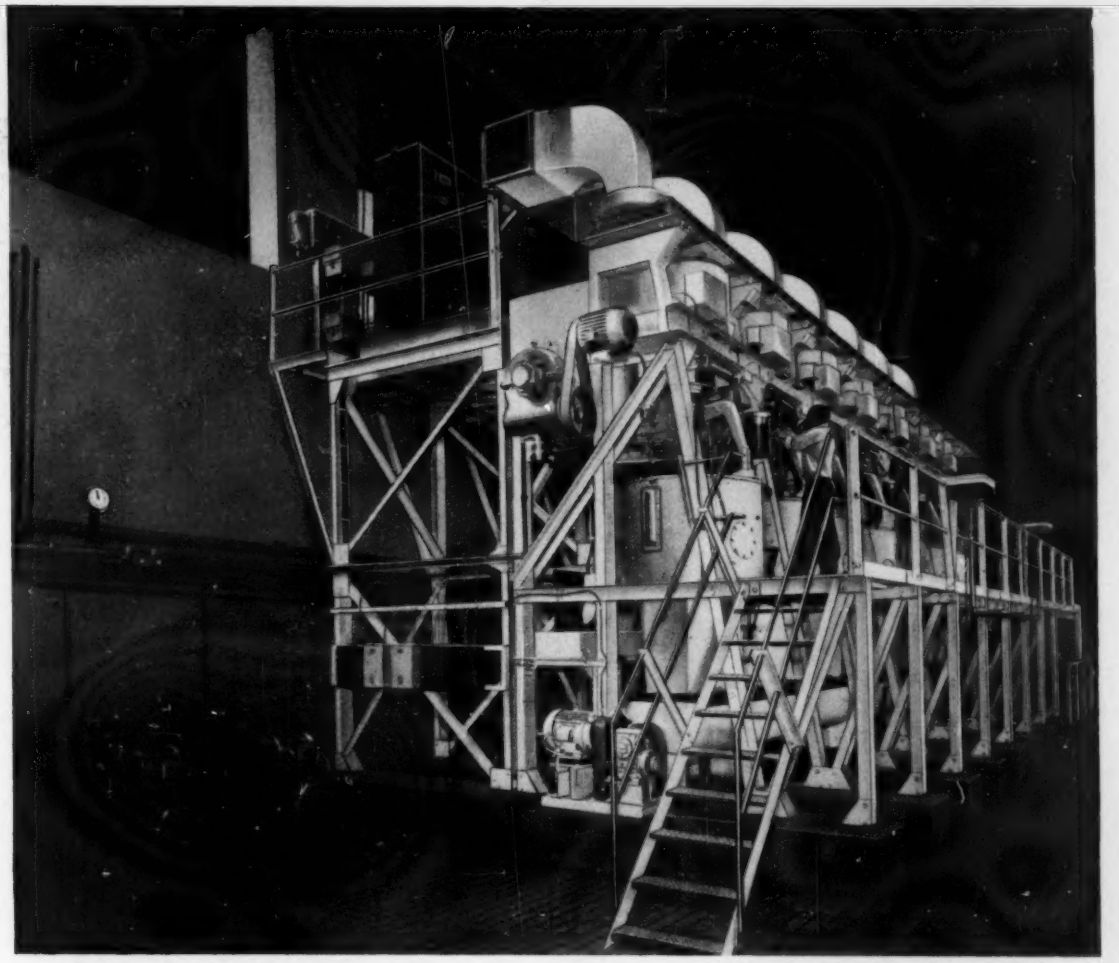
Mirrlees have exceptional experience in supplying cane and intermediate carrier chains for Sugar Mills. Full information on request.

Write for our Chains & Slats Brochure
S131 – 58

Mirrlees'

THE MIRRLEES WATSON COMPANY LIMITED

Scotland Street, Glasgow, C.5.
38 Grosvenor Gardens, London, S.W.1.



A battery of seven Broadbent Sugar Centrifugals installed at Sir J. L. Hulett's Darnall Factory, South Africa.

CENTRAL AND SOUTH AFRICA

A total of 64 Broadbent Sugar Centrifugals were supplied to Central and South Africa for the 1960 campaign, bringing the number installed in the area since 1954 to 229 machines.

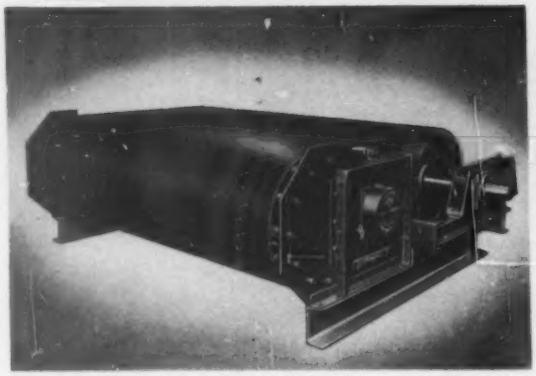
BROADBENT

THOMAS BROADBENT & SONS LTD . CENTRAL IRONWORKS . HUDDERSFIELD . ENGLAND

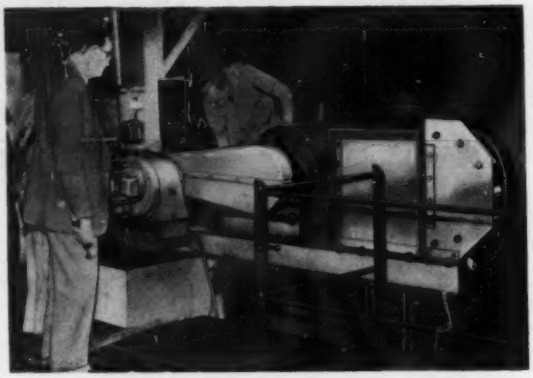
The World's largest manufacturer concentrating entirely on industrial centrifugals

Telephone 5520-5 *Telegrams: BROADBENT HUDDERSFIELD*

MAGNETIC CONVEYOR HEAD



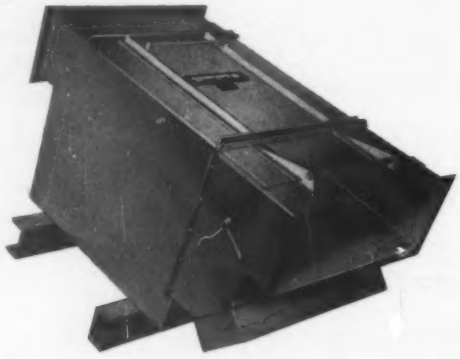
Boxmag patent MH. 2484. Conveyor Head built into an 84" wide short belt conveyor, photographed prior to despatch. The machine is designed for installation, as shown on the adjacent illustration.



Boxmag patent MH. 2484 installed in the chute between a sugar cane carrier and crusher, at a factory in Mauritius. It is designed to remove tramp metal automatically and continuously without an operator's attention. (write for leaflet 62/2).

MAGNETIC SEPARATORS PROTECT MACHINERY AND PRODUCTS

(Write for further details)



Boxmag Superflux Magnetic Chute for removal of ferrous contamination from refined sugar to decontaminate the product.

A Boxmag Unimajor block type Permanent Magnet. One of the many types of separators suitable for general applications in sugar factories. (write for details of full range).

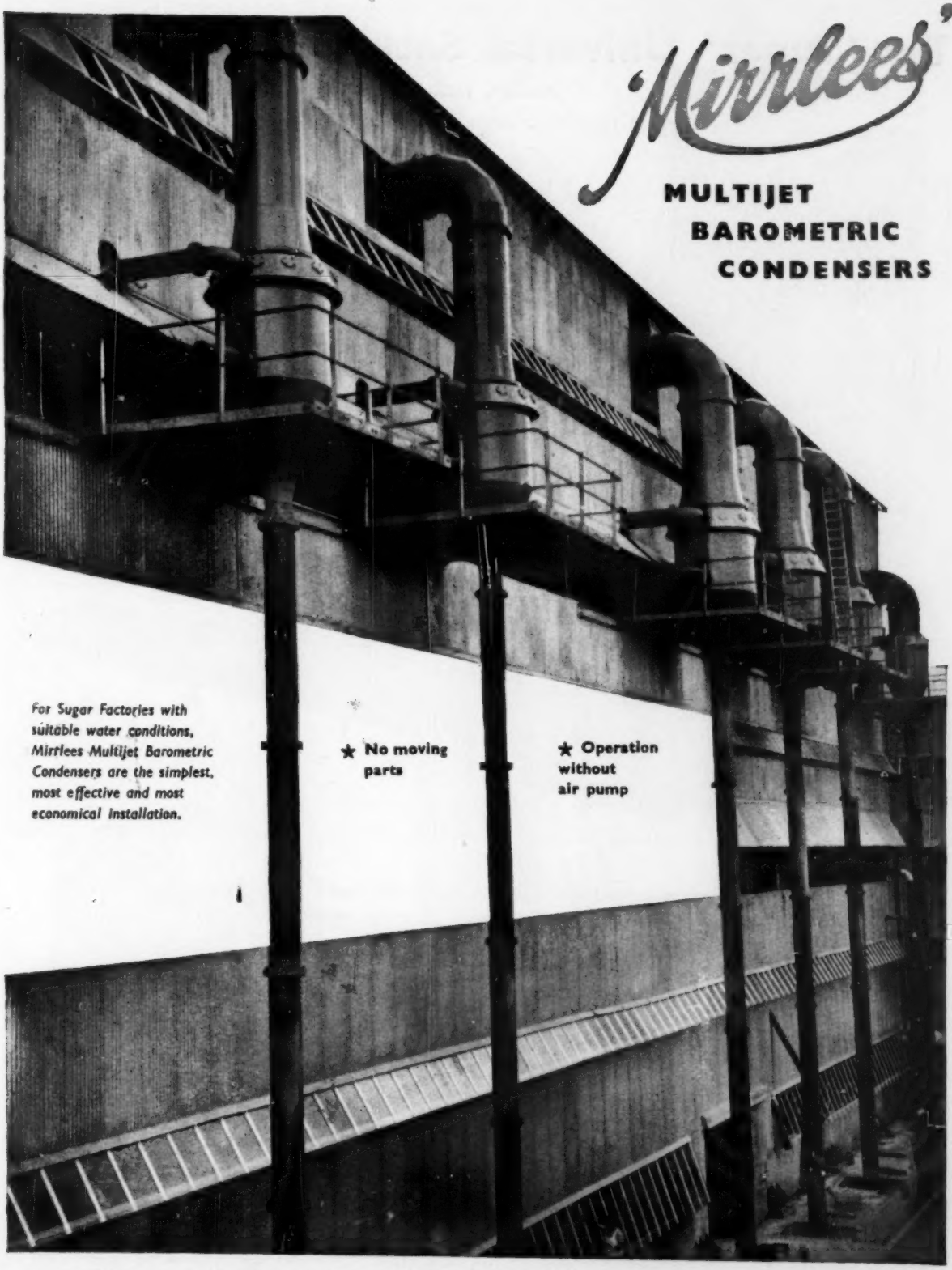
BOXMAG

Telephone
Central 5391

Telegrams :
Boxmag Birmingham

ELECTROMAGNETS LTD

BOXMAG WORKS · BOND ST. · HOCKLEY · BIRMINGHAM 19 · ENGLAND



'Mirrlees'

MULTIJET BAROMETRIC CONDENSERS

For Sugar Factories with suitable water conditions, Mirrlees Multijet Barometric Condensers are the simplest, most effective and most economical installation.

★ **No moving parts**

★ **Operation without air pump**

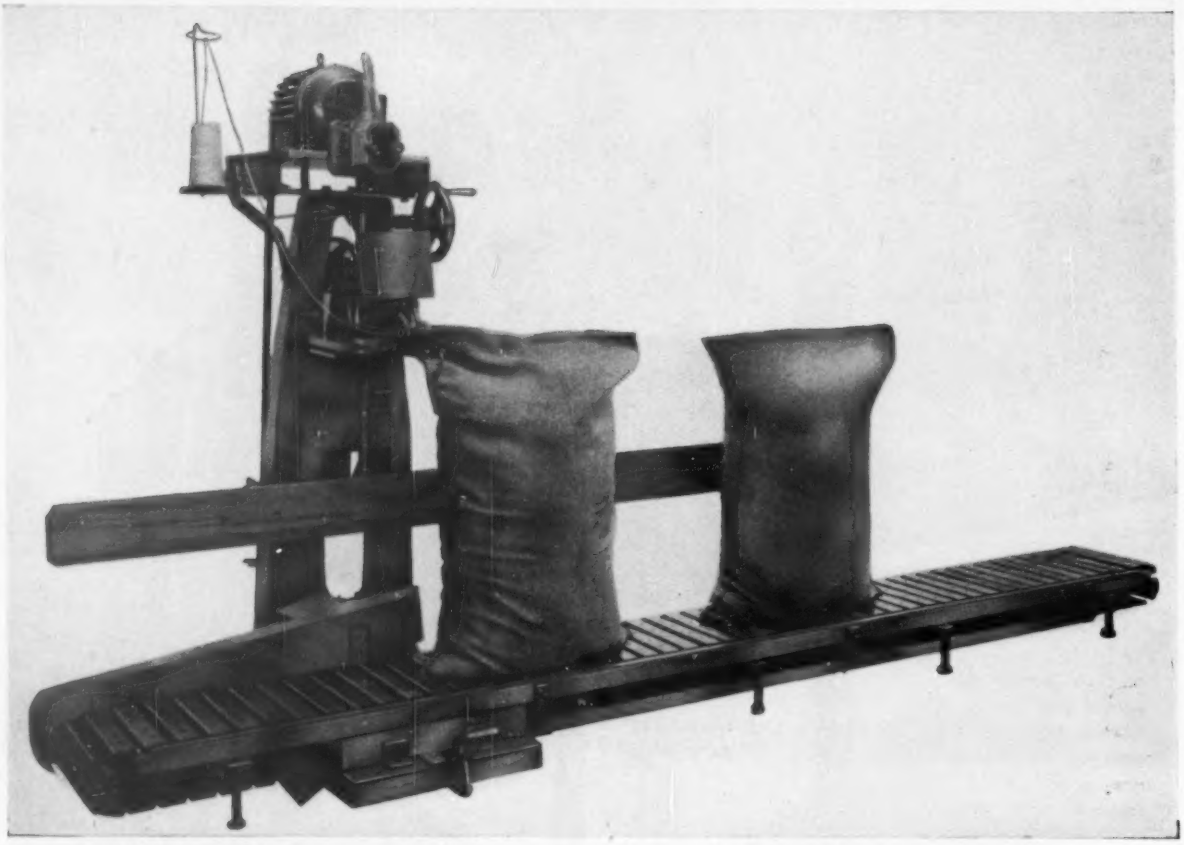
THE MIRRLEES WATSON COMPANY LIMITED

Head Office and Works : Scotland Street, Glasgow, C.5, Scotland. *London Office:* 38 Grosvenor Gardens, S.W.1

The 'Super' Universal Sack Closing Machine

MODEL NO. 5B

Fitted with 10 or 12 ft. Conveyor and Special Clutch Drive



This machine is fitted with a conveyor 10 or 12 ft. overall and a Special Clutch Drive which allows the conveyor to be run independently of the sewing head.

Jute, Hessian, Paper Lined Hessian, Cotton and Paper Sacks weighing from 50 to 325 lbs. can be sewn on this machine.

Machines can be seen working by appointment.

Power required 2 h.p. *Shipping weight : 14 cwts.*

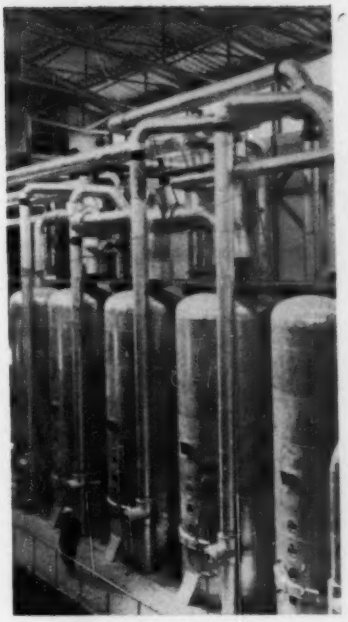
Manufactured in Great Britain by :

The Sack Filling & Sewing Machine Syndicate Limited

(Timewell's Patent)

TIMEWELL WORKS · LOCKFIELD AVENUE · BRIMSDOWN · ENFIELD . MIDDX.

Telephone : HOWARD 1188 *Telegrams :* FECIT, ENFIELD



PLANNING AND ERECTION OF COMPLETE CANE AND BEET SUGAR FACTORIES

SALZGITTER INDUSTRIEBAU-GESELLSCHAFT M.B.H.

VORMALS: DEUTSCHE BERGWERKS- UND HÜTTENBAU GESELLSCHAFT M. B. H.

SALZGITTER-DRÜTTE / WESTERN GERMANY

WELDED FABRICATION BY CLARKS OF HULL

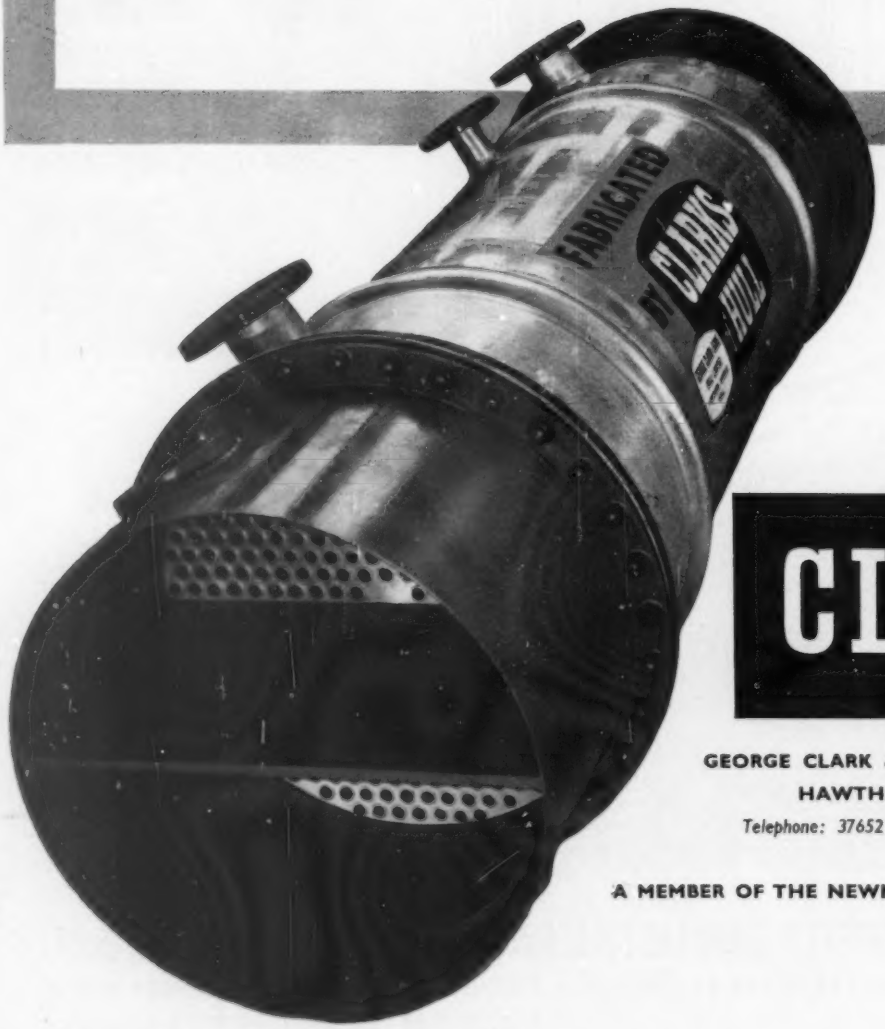
Realistic. Clarks view every aspect of a job through your eyes. Practical design service at your disposal. Delivery and economy studied at that stage, as well as efficiency. Every piece of equipment new and modern. Used with knowledge and experience that only a century of fabricating work can bring. You can depend on Clarks fabrications And on Clarks.

STAINLESS STEEL, MILD STEEL, ALUMINIUM AND COPPER FABRICATIONS COMPLETE WITH VALVEWORK AND PIPEWORK

METALLIC ARC WELDING

ARGONAUT AND ARGON-ARC WELDING

STRESS-RELIEVING AND TESTING FACILITIES



Aluminium and Mild Steel Cooler. Tube Sheets, Tubes and Shell 99.8% pure Aluminium with Mild Steel Ends.

CLARK

GEORGE CLARK & SONS (HULL) LTD.
HAWTHORN AVENUE, HULL
Telephone: 37652 Telegrams: 'Clark, Hull'

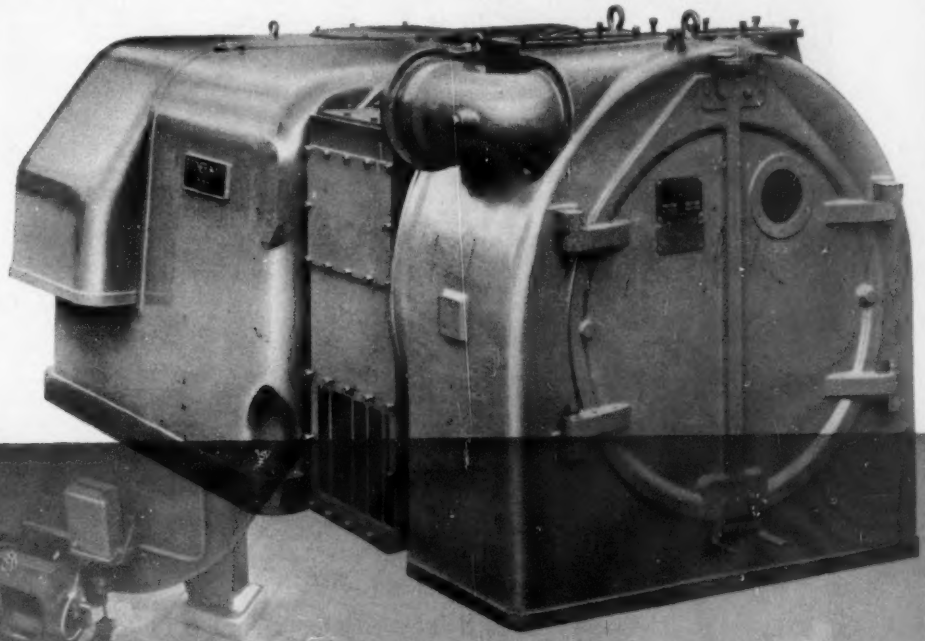
A MEMBER OF THE NEWMAN HENDER GROUP

BCA

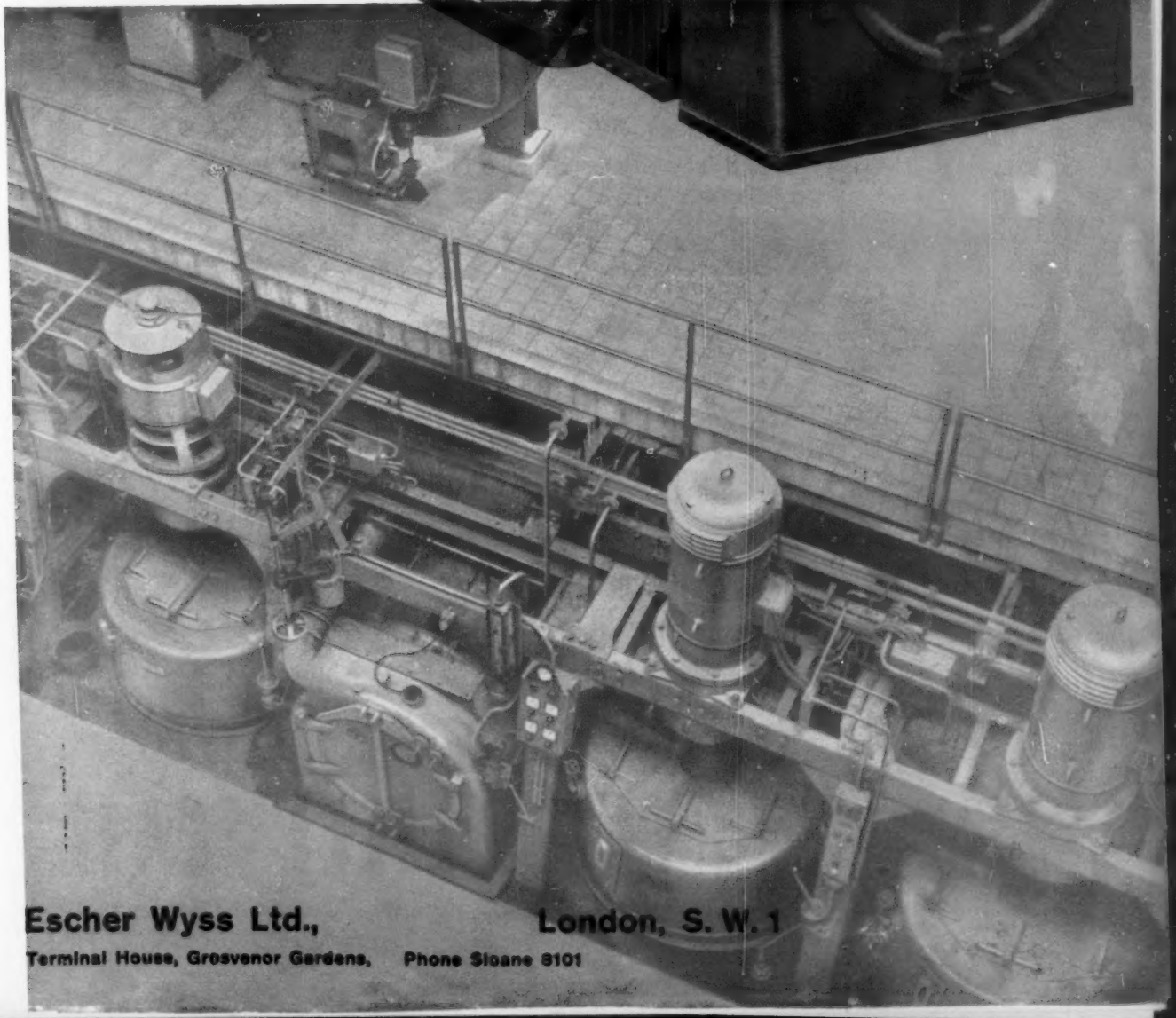
ESCHER WYSS

continuous centrifuges for the sugar industry

These centrifuges are in operation at Sugar Factories throughout the world.



Escher Wyss Centrifuge as replacement in a battery of vertical machines.



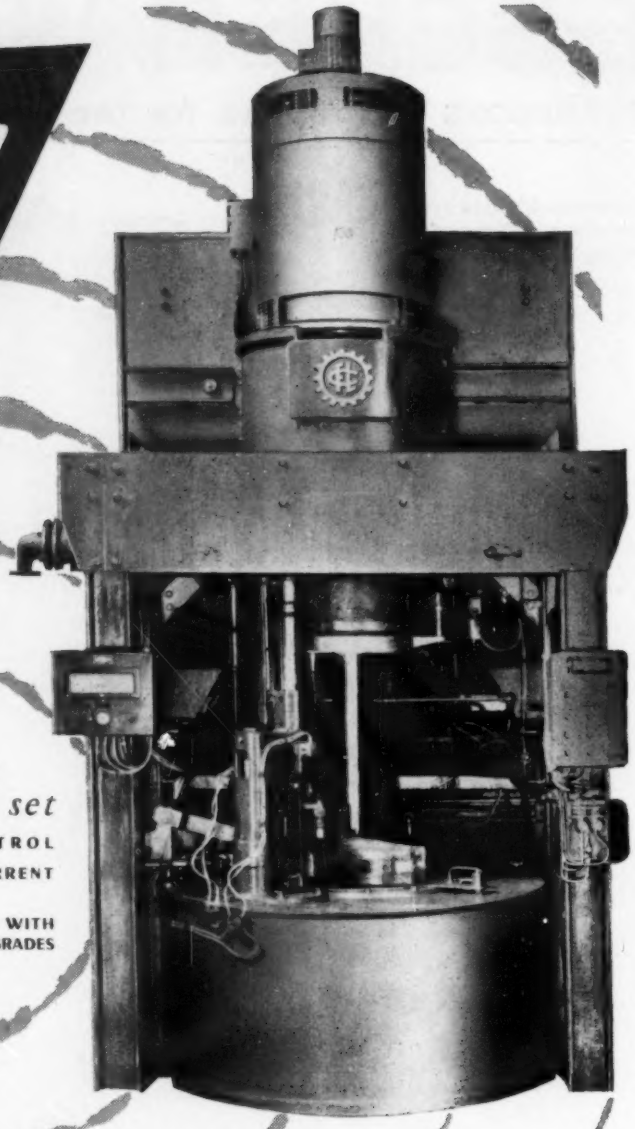
Escher Wyss Ltd., **London, S. W. 1**

Terminal House, Grosvenor Gardens, **Phone Sloane 8101**

Fully automatic!

the new

CENTRIFUGAL



driven by
WARD-LEONARD *set*

- ELECTRONIC CONTROL
- ELIMINATION OF CURRENT PEAKS
- RECORD PRODUCTION WITH MASSECUITES OF ALL GRADES

Battery of 4 centrifugals at the Fontaine-le-Dun Sugar Factory (France)

S.A.G. - PARIS

FIVES LILLE - CAIL

7, rue Montalivet, PARIS (8e) - Tél.: ANJou 22-01 et 32-40

AIR MAIL CORRESPONDENCE

CABLE: GRUPULCO
JEFFERSON 1-1220

GRUENDLER of ST. LOUIS

MANUFACTURERS AND ENGINEERS OF REDUCTION MACHINERY AND MATERIAL HANDLING EQUIPMENT

GRUENDLER CRUSHER & PULVERIZER CO.

2915-17 NORTH MARKET ST. · ST. LOUIS 6, MO. U.S.A.

FOREIGN SALES DIVISION REF.,

An open letter to
production-minded
Sugar Mill Management!

Should there be a sudden, unexpected demand for a sugar production increase because of changes in international markets, and this condition becomes a problem to you . . . the sugar division of our firm can be of genuine assistance:

(1) with definite knowledge gained by years of practical, worldwide experience working with sugar mill management;

(2) by installing the Gruendler Cane Shredder Process.

This Process is far less costly than the adoption of new stands of mills and is an accepted standard practice through the sugar-producing world. Our method, by its original, specialized shredding process of cane before it enters the mill tandem . . . increases sucrose extraction, increases capacity, reduces mill strain, produces better burning bagasse.

> For example, a mill in the Philippines reports: "Higher grinding rate with lower steam consumption on mills"; a Hawaiian mill confirms: "Higher capacity, better burning bagasse, higher extraction"; a major Mexican operation authenticates: "An increase in grinding rate of up to 30%".

The Gruendler Process is highly profitable in every respect. Amortization of the equipment in a single season is a common occurrence.

The big reason for this open letter is to inform you that we may be able to economically and efficiently help to solve the problems of meeting a sudden and increased sugar demand. You are respectfully invited to write or cable for complete information, authentic production reports and installation histories.

Sincerely,

GRUENDLER CRUSHER & PULVERIZER CO.

Leo Freeman

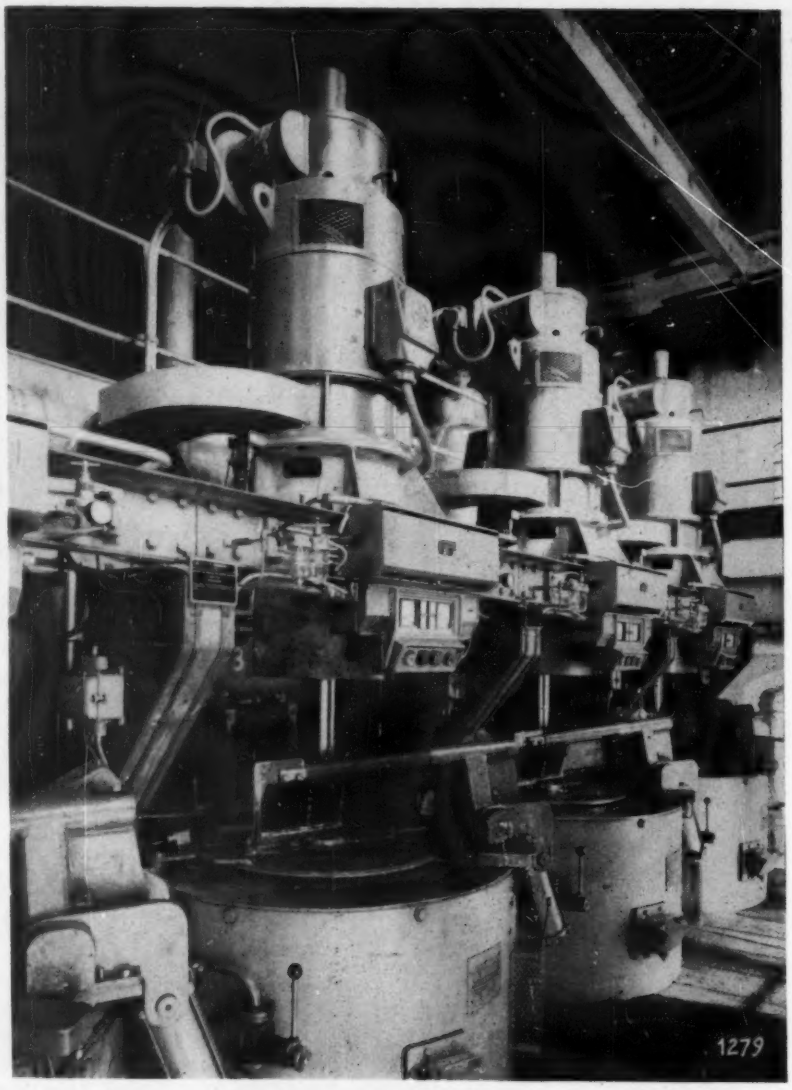
Leo Freeman, Vice-Pres. and Manager
Sugar Mill Division

LF-j

Since it was established in 1890, our Company has manufactured machinery for the sugar industry, and for more than forty years has specialized in constructing centrifugals.

Our Technical Service is continually developing machines which incorporate improvements designed to meet the technological requirements of new and varying processes in the sugar industry, taking into account the demands of the European Common Market.

The e new centrifugals are distinguished for their high grade of *standardization* and for their low cost both from the point of view of the purchase price and running costs.



FULLY AUTOMATIC SUGAR CENTRIFUGALS

Type	*Basket D × H*	*Basket cross section*	*Massecuite Max. Charge*	*Performances*		
				Mod.	*Max. sp. r.p.m.*	*Cycles per hr.*
"SCARA. U"	1250 × 830 mm.	Cylindrical with truncated cone shaped bottom	500 kg.	Normal	1000	30
				Velox	1500	25
"SCAME. P"	1050 × 585 mm.	Cylindrical with flat bottom	350 kg	Normal	1500	20
				Velox	1800	10
"SCAME. G"	1220 × 762 mm.	Cylindrical with flat bottom	650 kg.	Normal	1000	25
				Velox	1500	20

BOSCO TERNI

Officine Meccaniche e Fonderie

A. BOSCO

TERNI **ITALY**

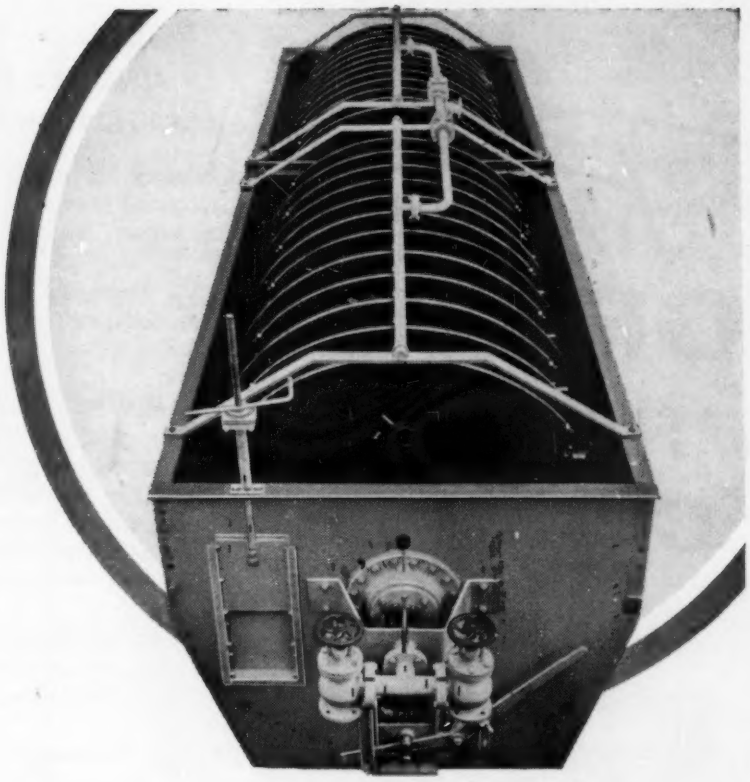
More than 500

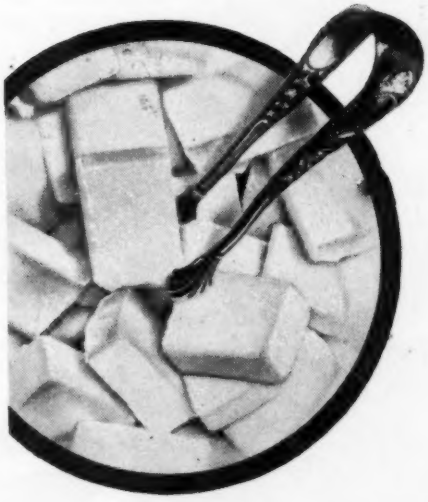
WERKSPOOR

Rapid Crystallizers

in use in

sugar factories





Applications for high grade as well as for LOW GRADE massecuites!

Licensees for the manufacturing of Werkspoor Rapid Crystallizers:

Ansaldo - San Giorgio
Genoa - Italy

Atlantic, Gulf and Pacific Company of Manila, Inc.
Manila - Philippines

Maschinenfabrik Buckau R. Wolf A.G.
Grevenbroich - Germany

Fives Lille - Cail S.A.
Paris - France

Honolulu Iron Works Co. Inc.
Honolulu - Hawaiian Islands

Honolulu Iron Works Co. Inc.
New York - U.S.A.

A. & W. Smith & Co. Ltd.
London - Great Britain

Succesores de Abarca Inc.
San Juan - Puerto Rico

WERKSPOOR

AMSTERDAM WORKS (Holland)

Presenting

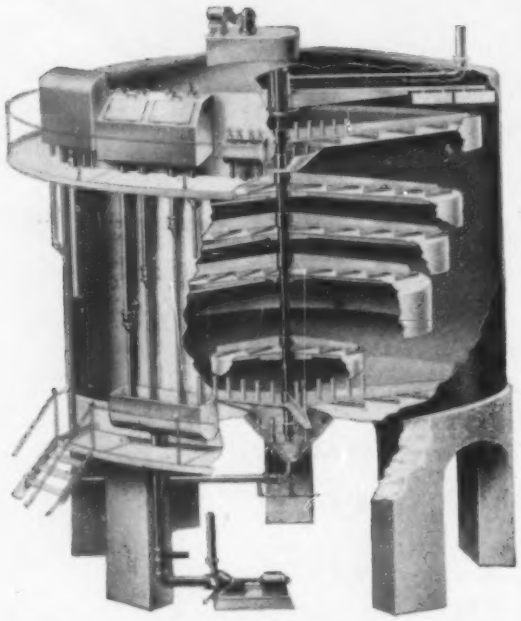
GRAVER PRIMA-SEP CLARIFIER

AN ADVANCED CONCEPT IN SUGAR CLARIFICATION WITH THESE ADVANTAGES

Primary Separation and Mud Removal — up to 60% of incoming juice impurities are removed by new primary tray and sump, leading to better, faster settling in entire unit.

25% Increased Capacity—faster throughout and shorter retention time, due to improved "free-fall" sedimentation, increase capacity 25%.

Complete "Free-Fall" Settling—Prima-Sep has new large peripheral "free-fall" settling area where solids settle more rapidly and completely because they are unhindered. More solids than ever before are removed, including finest bagacillo, and juice is sparkling clear. New method means hybrid canes can be treated as easily as native canes and mechanized processing can be used wherever desired.



Greater Mud Thickening—new mud pickets on the primary and final mud removal scrapers, and separate pickets in the sumps, provide maximum mud thickening, low filtrate return.

Process Economy — greater and faster clarification at all solids and viscosity levels means less time and expense in harvesting, washing and processing canes... greater yield of raw sugar... reduced requirements for maceration water, steam, evaporator pan and vacuum filters... absolute minimum of inversion.

. . . . . .

Based on the most modern principles of sugar clarification, improved Prima-Sep design is backed by Graver's world-wide sugar experience of over 20 years. These new features bring you the greatest economy and clarification at the highest rate while maintaining the advantages and efficiency of multi-tray design.

REQUEST NEW BULLETIN WC-125

MECHANS LIMITED

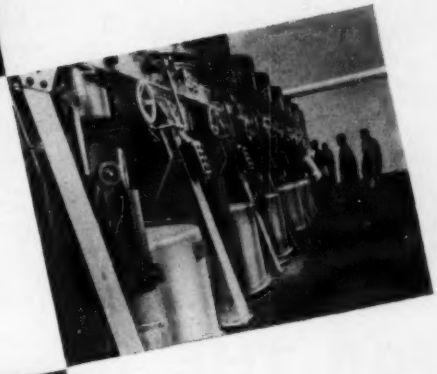
IN ASSOCIATION WITH

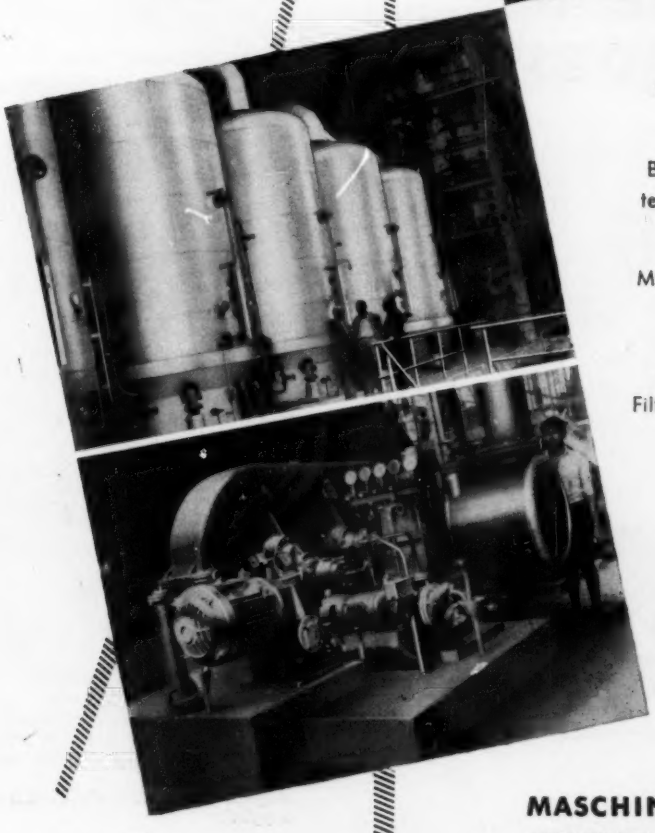
GRAVER WATER CONDITIONING CO.

Scotstoun Iron Works, Glasgow, W.4

COMPLETE SUGAR FACTORIES

INCLUDING
CUBE SUGAR AND LOAF SUGAR PLANTS





for the production of cane sugar up to highest grade refined sugar.

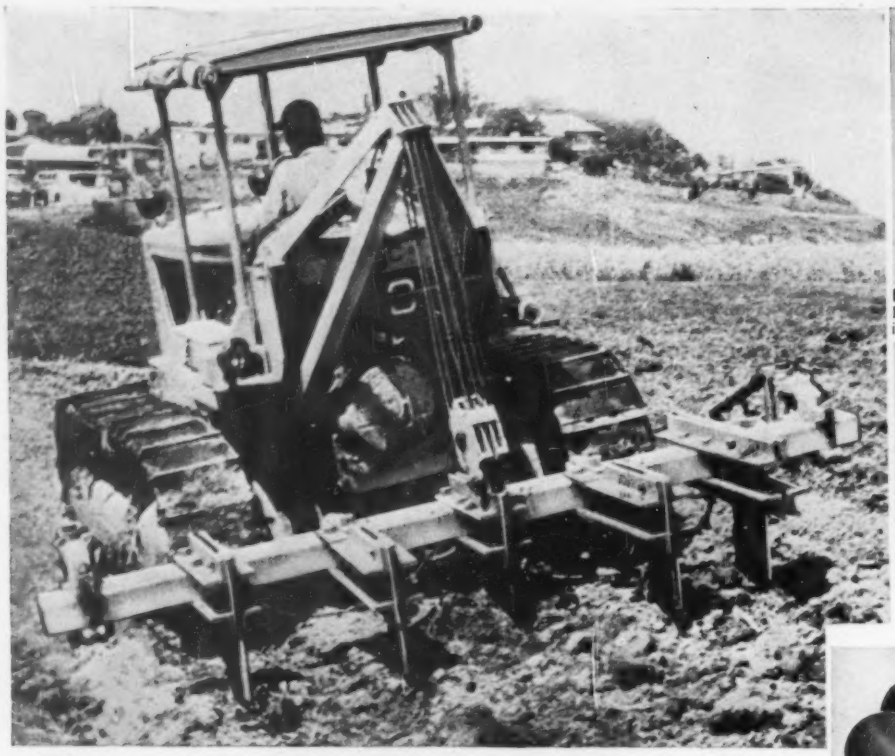
Basing on modern development in sugar technology we modernize plants of older design to obtain the highest economy.

Mill plants with single and group drive · Especially reconstruction of outdated mills · Centrifugal machines for white sugar, refined sugar, raw sugar. Filter plants suitable to solve all problems of filtration · Drying plants for the sugar industry · Power stations for all pressures and capacities.

Delivery of single machines and apparatus · Planning and erection of complete cane and beet sugar factories.

MASCHINENFABRIK BUCKAU R. WOLF
AKTIENGESELLSCHAFT · GREVENBROICH-NEUSS
(WESTERN GERMANY)

9068 a



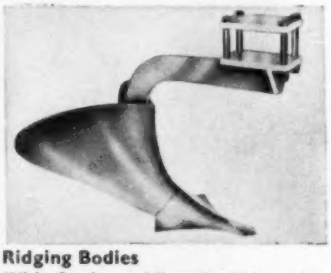
Ripper Tines
Exceptionally strong, for breaking up soil to a depth of 15 ins.

Trenching Bodies
Have adjustable mouldboards for widths from 30 in. to 45 in. and depths up to 24 in.

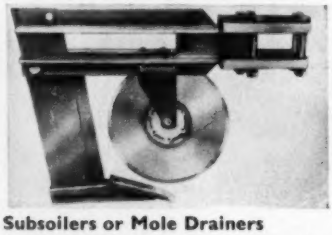
TOOLS FOR THE TOUGHER JOBS

Designed for use on sugar cane and other plantations, these heavy-duty tillage tools have been specially introduced for attaching to the standard toolbars of the more powerful tractors. They will give first-class service under strenuous conditions and the range covers tools for subsoiling, cultivating, ridging and trenching. Owners of suitable tractors will find them invaluable for a wide variety of operations.

Write for illustrated literature of these and of Ransomes agricultural machinery, including share and disc ploughs, cultivators, toolbars, disc harrows, subsoilers, mole drainers, ridgers, potato diggers, combine harvesters, maize shellers, peanut thrashers and shellers, sprayers and driers.



Ridging Bodies
With fixed mouldboards 28 in. wide and 19 in. high.



Subsoilers or Mole Drainers
Standards in two sizes, 8 in. × 1 in. and 6 in. × 1 in. section, with fixed or swivel adapter, and with or without disc coulter. Depth of work up to 22 ins.
Adjustable depth wheel can be supplied

Ransomes

Famous throughout the world for agricultural machinery

DISTRIBUTORS IN MOST COUNTRIES

RANSOMES SIMS & JEFFERIES LTD. · IPSWICH · ENGLAND

YORKSHIRE IMPERIAL METALS LIMITED

YORKSHIRE IMPERIAL

place at your disposal
their long, specialised experience
in the metallurgical development
and manufacture of

TUBES FOR THE SUGAR INDUSTRY

The resources of Yorkshire Imperial Metals Limited are devoted solely to the manufacture of non-ferrous tubes, plates and fittings, and plastic tubes and fittings. They have long been intimately associated with the Sugar Industry, both at home and overseas, and have made a careful study of the varied and often arduous operating conditions which obtain in the Industry. This study has resulted in the development of improved tube and plate alloys, metallurgically designed and scientifically manufactured to give the best possible service. This unrivalled experience is at your service, free of charge and without obligation, to assist in the solution of problems of all kinds affecting the life and use of non-ferrous tubes and plates.

Yorkshire Imperial craftsmanship, metallurgical skill and specialised experience, together with modern plant and methods and accurate control at every stage of manufacture, account for the enviable reputation which *Yorkshire Imperial* tubes and plates and *Yorkshire Imperial* fittings have achieved in their respective fields.

TUBES IN "YORCORON" · "KUNIFER 10" · COPPER AND "SEVA" BRASS · PLATES IN A WIDE RANGE OF ALLOYS · BI-METAL TUBES AND PLATES.

HEAD OFFICE—P.O. BOX 166, LEEDS. TELEPHONE: LEEDS 7-2222

A machine which has given evidence of its efficiency in a world-renowned refinery,

the fully automatic

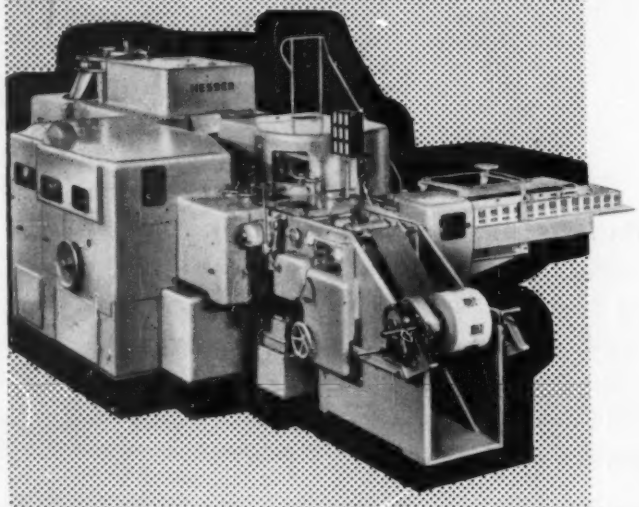
Sugar Packaging Machine Type PUB
with **especially high** output

Type of package: single bag package

Type of closure: rolled in, folded over and fixed by adhesive

Operation method: Manufacture of packages from blank paper reel with incorporated aniline printing device;
forming and folding over continuously travelling mandrels;
filling with weighers or volume filler and finally closing and sealing in
one continuous operation

HESSER



Output: up to 240 packages/min.

The paper can be fed also from pre-printed reels by means of a photo-electric registration device or it can be printed in the machine by **an aniline printing device.**

Efficient vibration and automatic paper trimming ensure neat and firm packages.

If you should like to obtain more details of this or any other sugar packaging machine, please contact us or our UK agency, Messrs.

Jahn (Maskiner) Ltd., 34 York Way
King's Cross **London N.1**

97/1

FR. HESSER Maschinenfabrik-Aktiengesellschaft
Stuttgart-Bad Cannstatt · Germany

Use rugged LINK-BELT

900

class chain

for intermediate cane carrier service

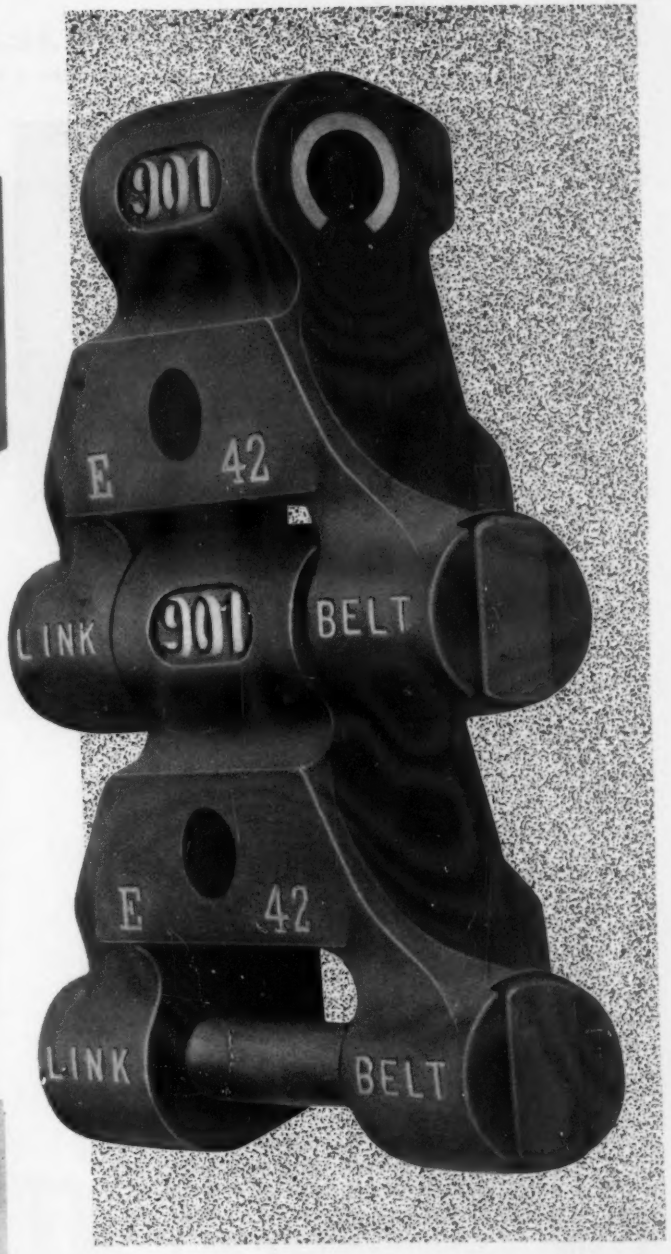
You cut downtime to a minimum when you specify Link-Belt 900 Class chain for intermediate carrier service.

This durable chain stands up under the most gruelling and corrosive carrier conditions. The special Link-Belt rib design gives additional link strength. Double sprockets contact outboard driving lugs . . . bagasse cannot jam in centre pockets of links with this method of driving. Result: Longer trouble free operation . . . fewer conveyor shutdowns.

Link frames—available in malleable iron, Promal, bronze or stainless steel—can be furnished with pins and bushings of either carbon steel, bronze or stainless steel.

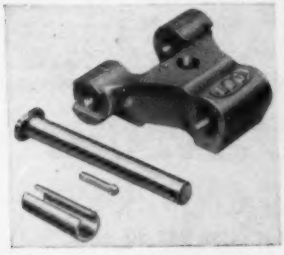
For complete information on Link-Belt chains and sprockets, contact your Link-Belt representative. Or write direct for Book 2640 containing full information on Link-Belt's complete line of sugar-handling equipment.

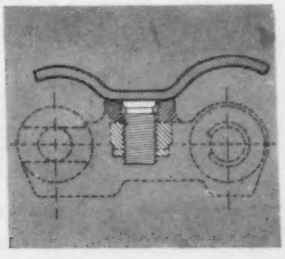
15,051-R



COMPONENTS are accurately made, carefully assembled. Wearing shoes at open end of link prevent tilting. Bushings are renewable, fit securely in barrel. Pins are firmly locked to prevent rotation in sidebar—cotter type assures easy assembly.

WELDED STUD SLATS eliminate slat hole elongation, prevent juice leakage and resist corrosion. Longer carrier life is assured because slats and chains are properly matched. Stainless steel self-locking nuts should be tightened with a torque wrench in assembly . . . disassembly is easy.





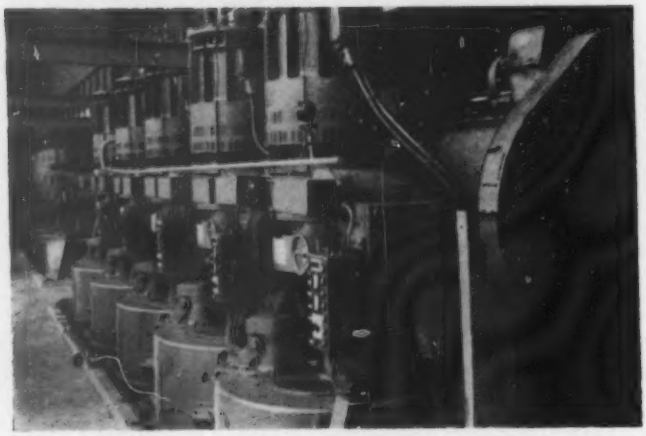
LINK-BELT

CHAINS • SPROCKETS • SLATS

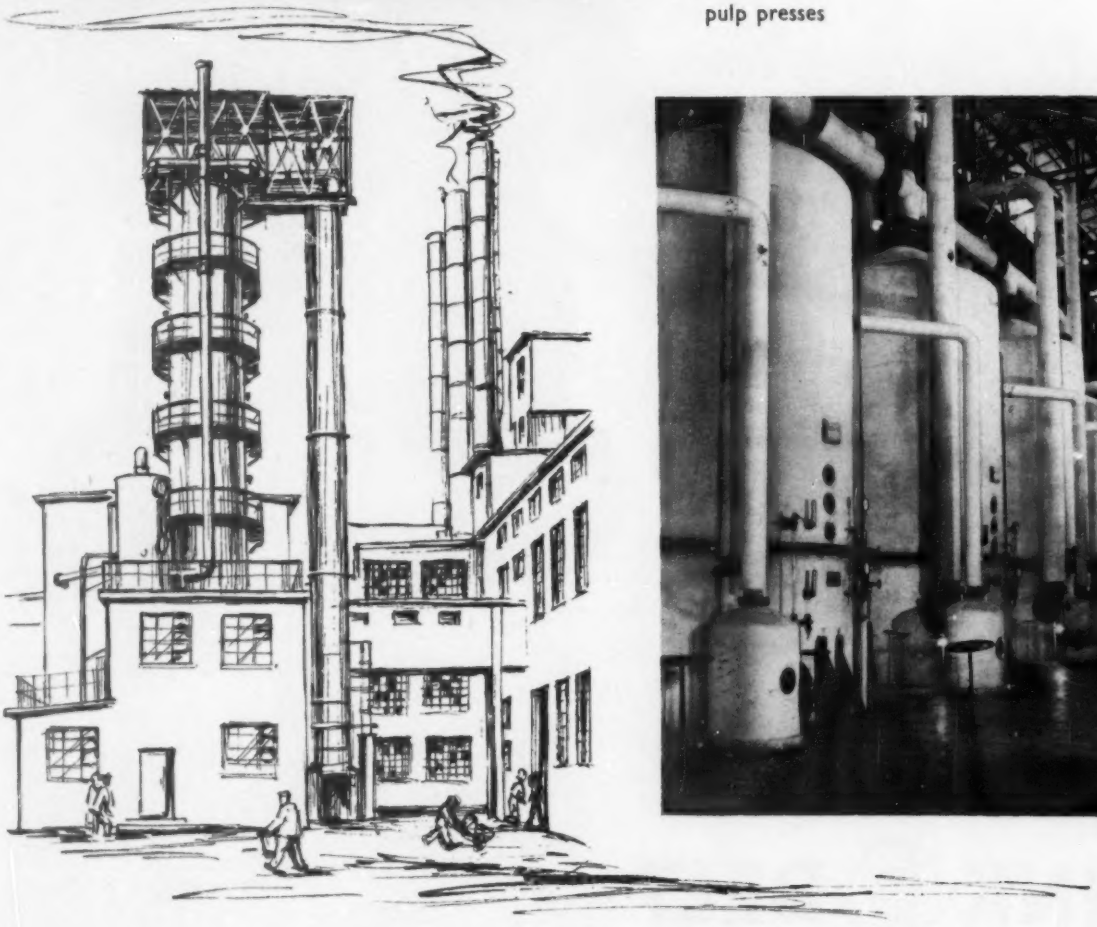
LINK-BELT COMPANY : Engineers · Manufacturers · Exporters of Machinery for Handling Materials and Transmitting Power · Established 1875. **EXPORT DIVISION** : Dept. 1260-ISJ, 233 Broadway, New York 7, U.S.A., Cable Address : Linkbelt—New York · Australia, Marrickville (Sydney) · Brazil, Sao Paulo · Canada, Scarboro (Toronto) · South Africa, Springs. · Representatives Throughout the World.

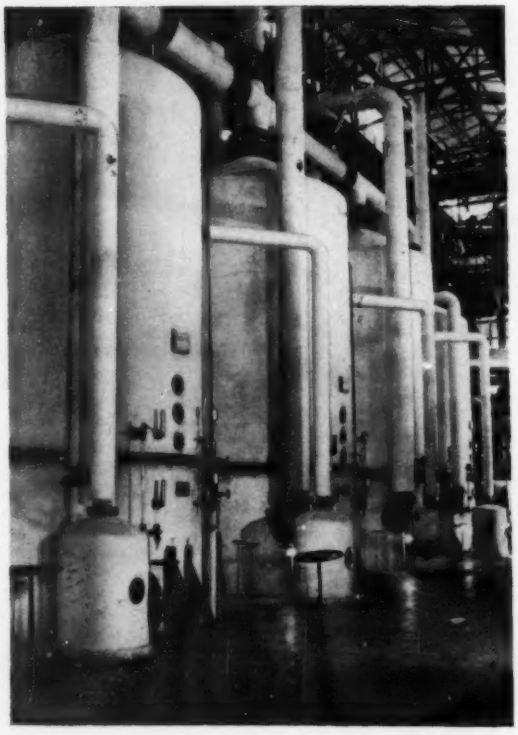
INVEST EXPORT

Sole Exporters from the German Democratic Republic of



Complete beet sugar factories
Complete cane sugar factories
Sugar refineries
Reconstruction of existing sugar factories
Enlargement of existing sugar factories
Individual machinery and equipment for the sugar industry, such as
- programme-controlled centrifugals
- non-cell-divided drum type vacuum filters
- evaporators
- vacuum pans
- beet slicers
- pulp presses





More than 300 sugar factories have been erected by our manufacturers in all parts of the world.

INVEST EXPORT

DEUTSCHER INNEN- UND AUSSENHANDEL
Berlin N 54, Brunnenstrasse 188-90 Telex: 011358 Cables: DIAINVESTA
GERMAN DEMOCRATIC REPUBLIC

versatile
RENOLD
chains
last
longer

CANE CONDUCTOR CHAIN

BAGASSE CHAIN

move
cane
and
sugar
quicker

FEEDER TABLE CHAIN

Renold conveyor chains, specially designed and manufactured for heavy and arduous duties such as cane and bagasse handling, were first supplied to the industry in 1920 and some installed in Cuba in 1925 are still in service after carrying over 6½ million tons of cane. They offer the attractive combination of high strength and low price and are outstanding in providing 20% more bearing area than most competitive makes.

RENOLD

CONVEYOR CHAINS FOR THE CANE SUGAR INDUSTRY

RENOLD

RENOLD CHAINS LIMITED • MANCHESTER

2,376 Copper tubes went into the fabrication of this EVAPORATOR cell.

WE

Guarantee

the HIGH
EVAPORATION
rate of a

K.I.W.

EVAPORATOR

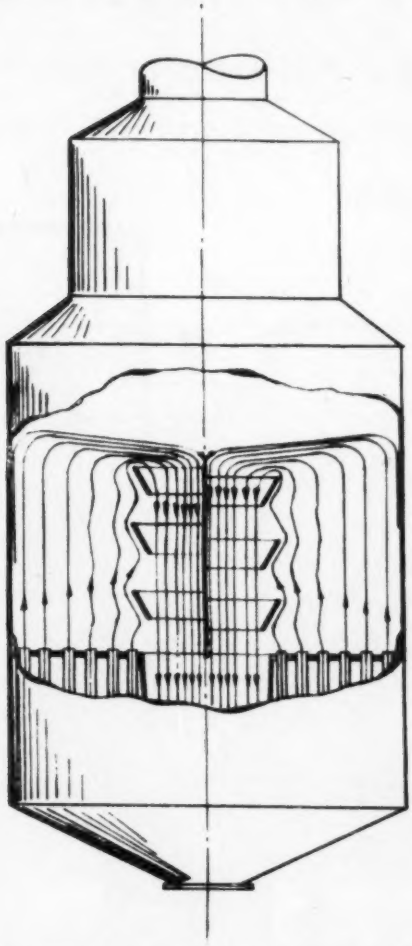
KINGSTON
INDUSTRIAL
WORKS LTD.
Spanish Town Rd.

Cable
INDUSTRIAL
for
QUOTATIONS

Kingston 11. Jamaica.

HONIRON Louvres

give top-to-bottom pan circulation



IMPROVE CIRCULATION IN YOUR CALANDRIA PAN BY INSTALLING HONIRON PATENTED LOUVRES IN TIME FOR THE COMING CROP!

LOUVRES are a design feature of the patented Hamill Low-Head vacuum pan of which two hundred thirty-eight have been installed in twenty-nine countries. In addition, fifty-three sets of louvres have been installed in existing pans.

HONOLULU IRON WORKS CO.

HONOLULU, HAWAII • HILO, HAWAII • MANILA, PHILIPPINES

165 BROADWAY, NEW YORK 6, N. Y.

CABLE: HONIRON NEW YORK

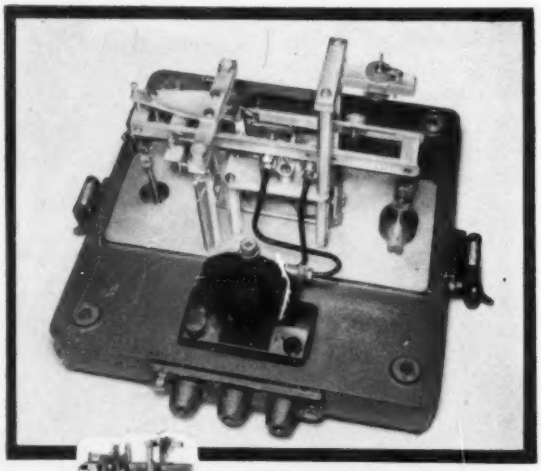
MORE ACCURATE DENSITY MEASUREMENT

— new design of RM Density Meter gives improved sensitivity and offers temperature compensation.

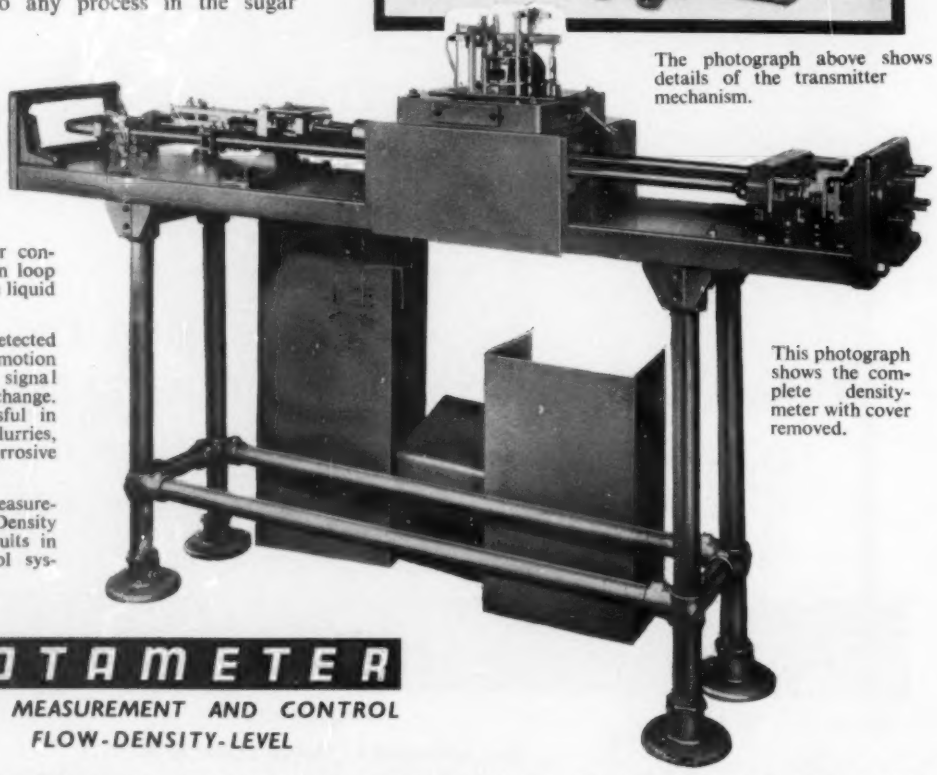
This new design, the Mk. 3 R.M. Density Meter, embodies many improvements including the following:

* Maximum sensitivity 0·025 gm/ml density change full scale.
* Compensation for change in process temperature as an option.
* Total enclosure protects against unauthorised adjustment and dirty atmospheres.
* Easy access to all adjustments.
* Choice of pipe size: 1″, 1¼″ or 1½″ bore.
* Redesigned transmitter eliminates massive damping and saves space.

We shall be pleased to give further information, or to advise on the application of the R.M. Density Meter to any process in the sugar industry.



The photograph above shows details of the transmitter mechanism.



This photograph shows the complete density-meter with cover removed.

The R.M. Density Meter continuously weighs a hairpin loop of pipe through which the liquid or slurry is fed.

Changes in density are detected by pneumatic or electric motion balance to provide a signal linearly related to density change. It is particularly successful in dealing with muds and slurries, and will handle most corrosive liquids if required.

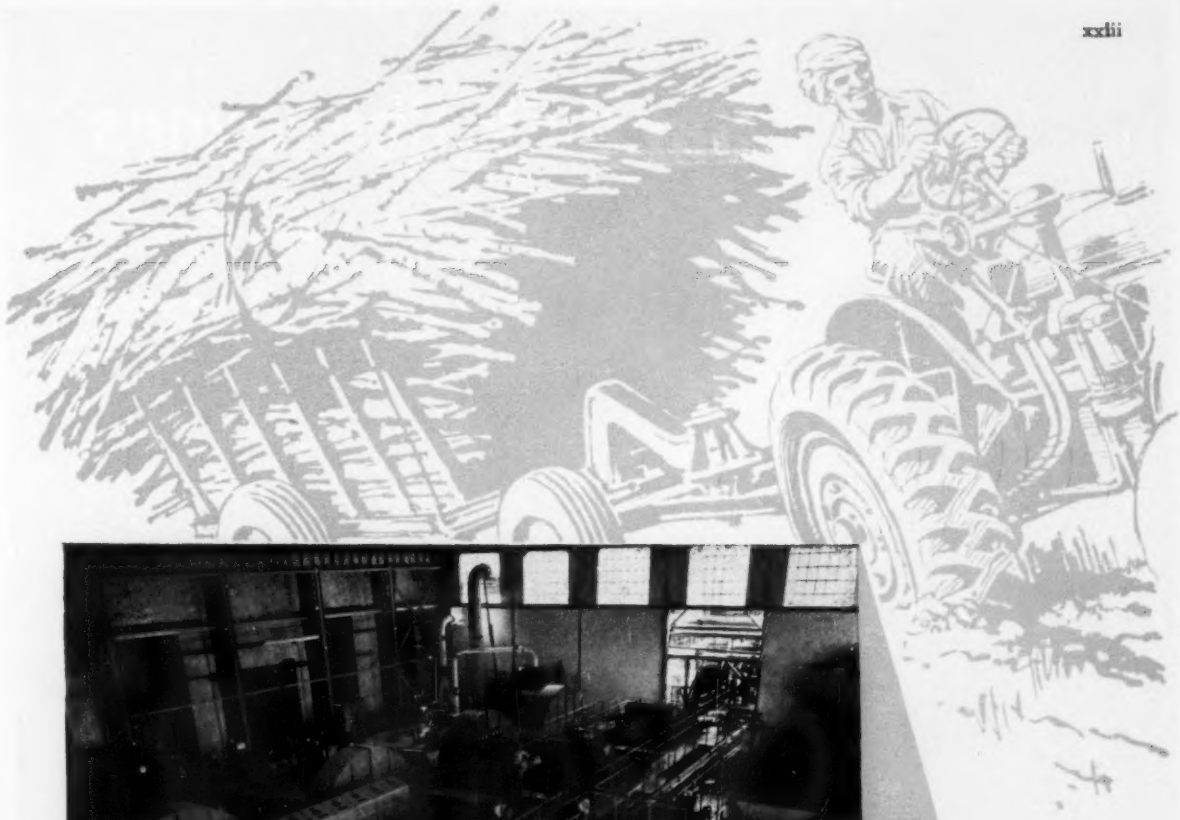
On account of its small measurement lag the R.M. Density Meter gives excellent results in automatic density control systems.

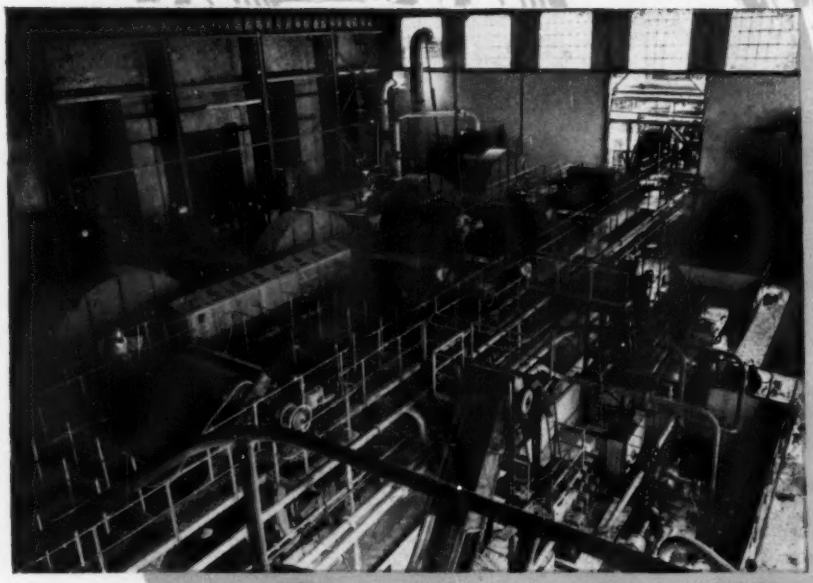
ROTAMETER

FLUID MEASUREMENT AND CONTROL
FLOW-DENSITY-LEVEL

ROTAMETER MANUFACTURING CO. LTD., PURLEY WAY, CROYDON, SURREY Telex: 24292 Telephone: CROydon 3816/9

D42/524





Complete Sugar Plants

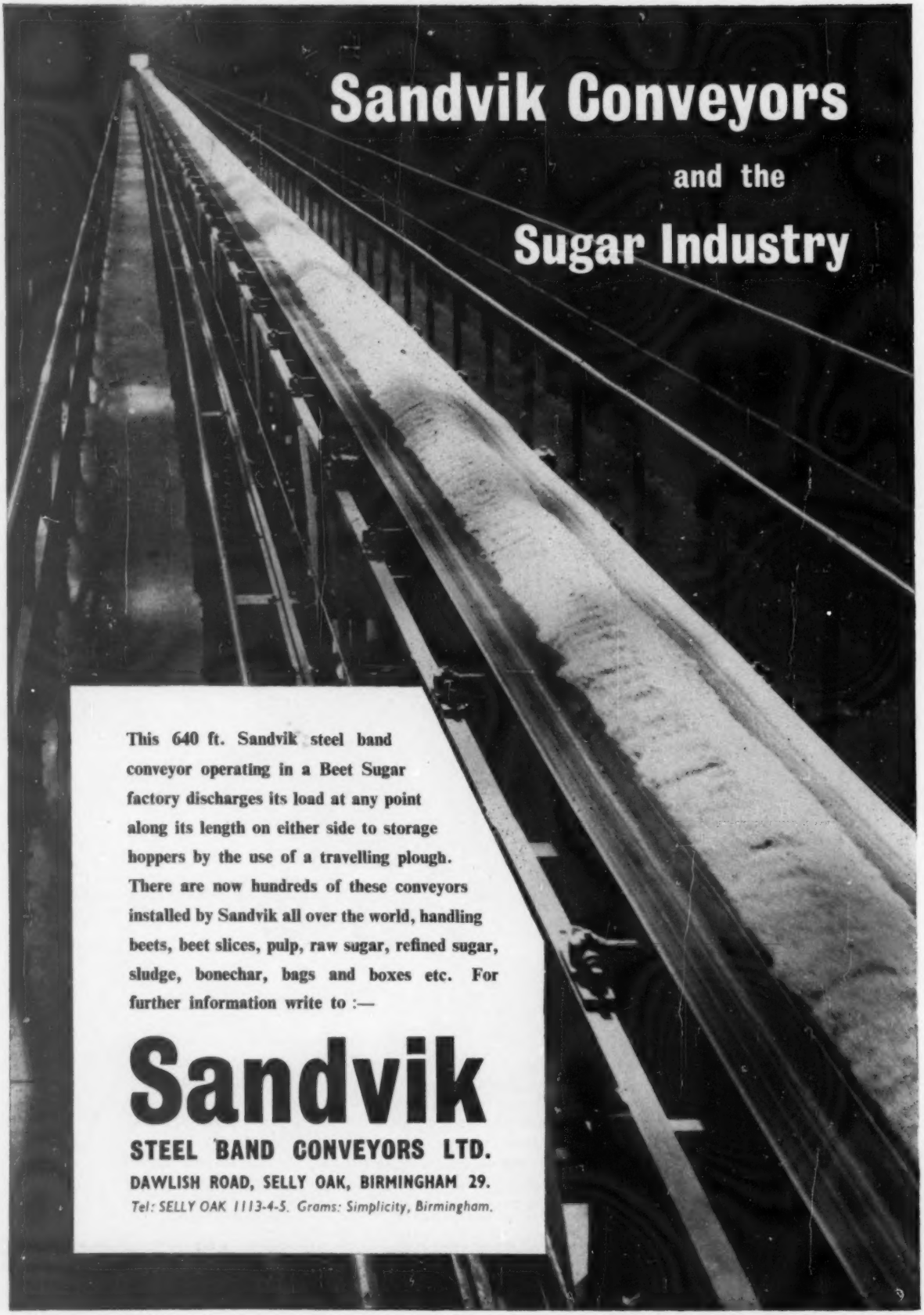
Over a long period Czechoslovak industry has gained a reputation for installing, extending and reconstructing Cane and Beet Sugar Plants.

As a result the advanced design and high quality of Czechoslovak machinery is appreciated in hundreds of Sugar Plants and Refineries all over the world: Sugar Plants in India, China and Ceylon as well as numerous plants in U.S.S.R. being among the latest to which deliveries have been made.

In Czechoslovakia we design, build and supply equipment incorporating the latest techniques for complete Sugar Plants of all kinds and sizes.

For further information write to:—

TECHNOEXPORT PRAHA CZECHOSLOVAKIA



This 640 ft. Sandvik steel band conveyor operating in a Beet Sugar factory discharges its load at any point along its length on either side to storage hoppers by the use of a travelling plough. There are now hundreds of these conveyors installed by Sandvik all over the world, handling beets, beet slices, pulp, raw sugar, refined sugar, sludge, bonechar, bags and boxes etc. For further information write to :—

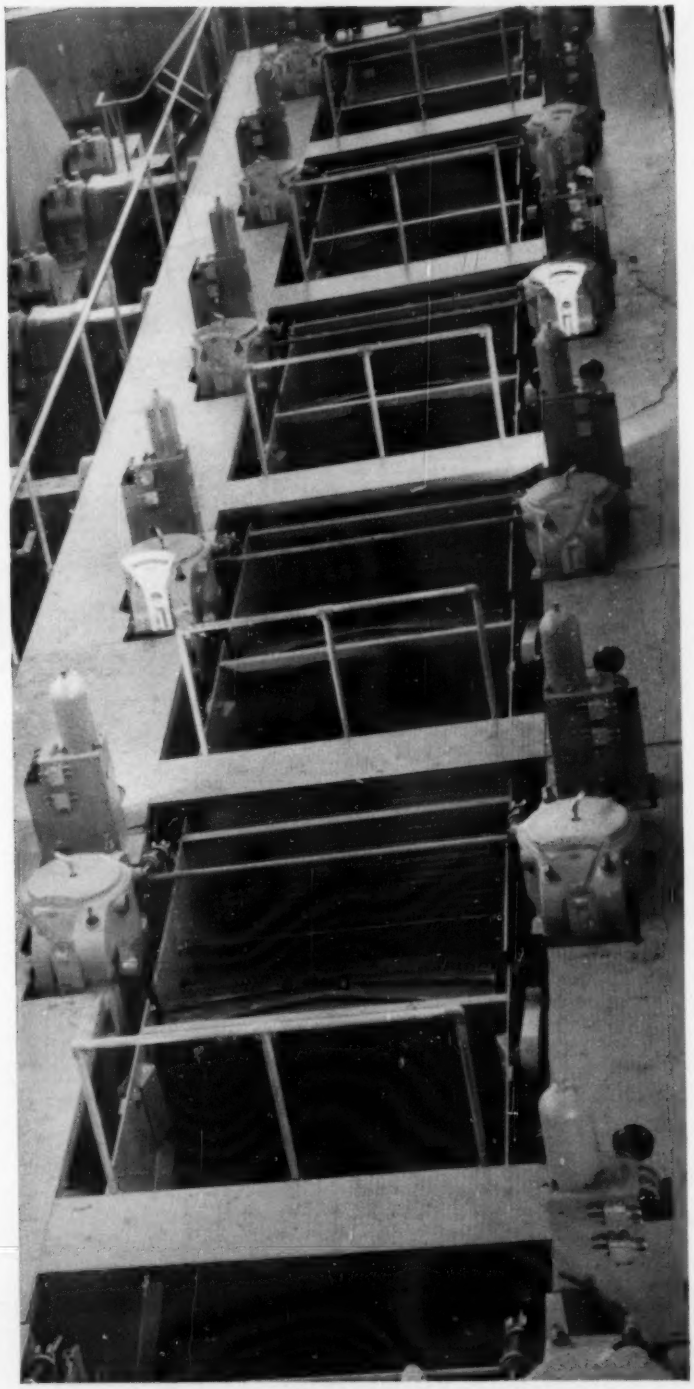
Sandvik

STEEL BAND CONVEYORS LTD.

DAWLISH ROAD, SELLY OAK, BIRMINGHAM 29.

Tel: SELLY OAK 1113-4-5. Grams: Simplicity, Birmingham.

Why the rapidly increasing demand for Farrel sugar mills?



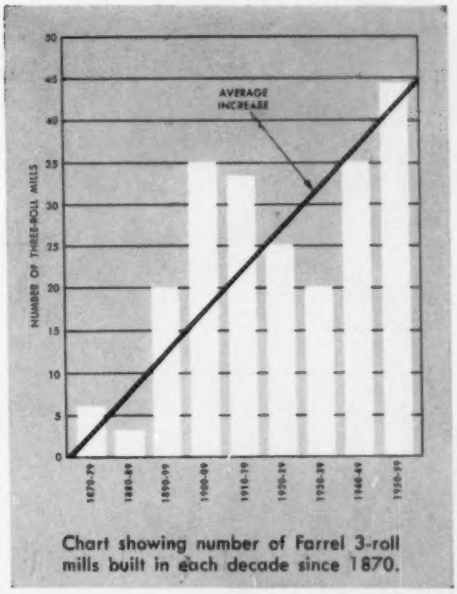


Chart showing number of Farrel 3-roll mills built in each decade since 1870.

Because, in recent years Farrel has pioneered a number of major refinements in sugar-grinding equipment.

For example, improvements in hydraulic ram mechanisms to maintain uniform roll pressure, and the introduction of force-feed rollers have resulted in increased sucrose extraction. Automatic lubrication of roll journals and centralized drive control for individual mills reduce costs for operating personnel.

New designs for side and top caps have been developed to permit fast, vertical removal of all rolls for regrooving and other maintenance. Time required for removal of hydraulic pistons and intermediate carriers has also been reduced.

Stronger housings and safeguards against corrosion add years to the life expectancy of mills. New hardened crownwheels, fabricated gears and rubber-belt carriers are establishing records for durability.

These are only a few of the recent innovations that have led to the increased demand for Farrel mills. For the full story, send for a copy of bulletin 312.

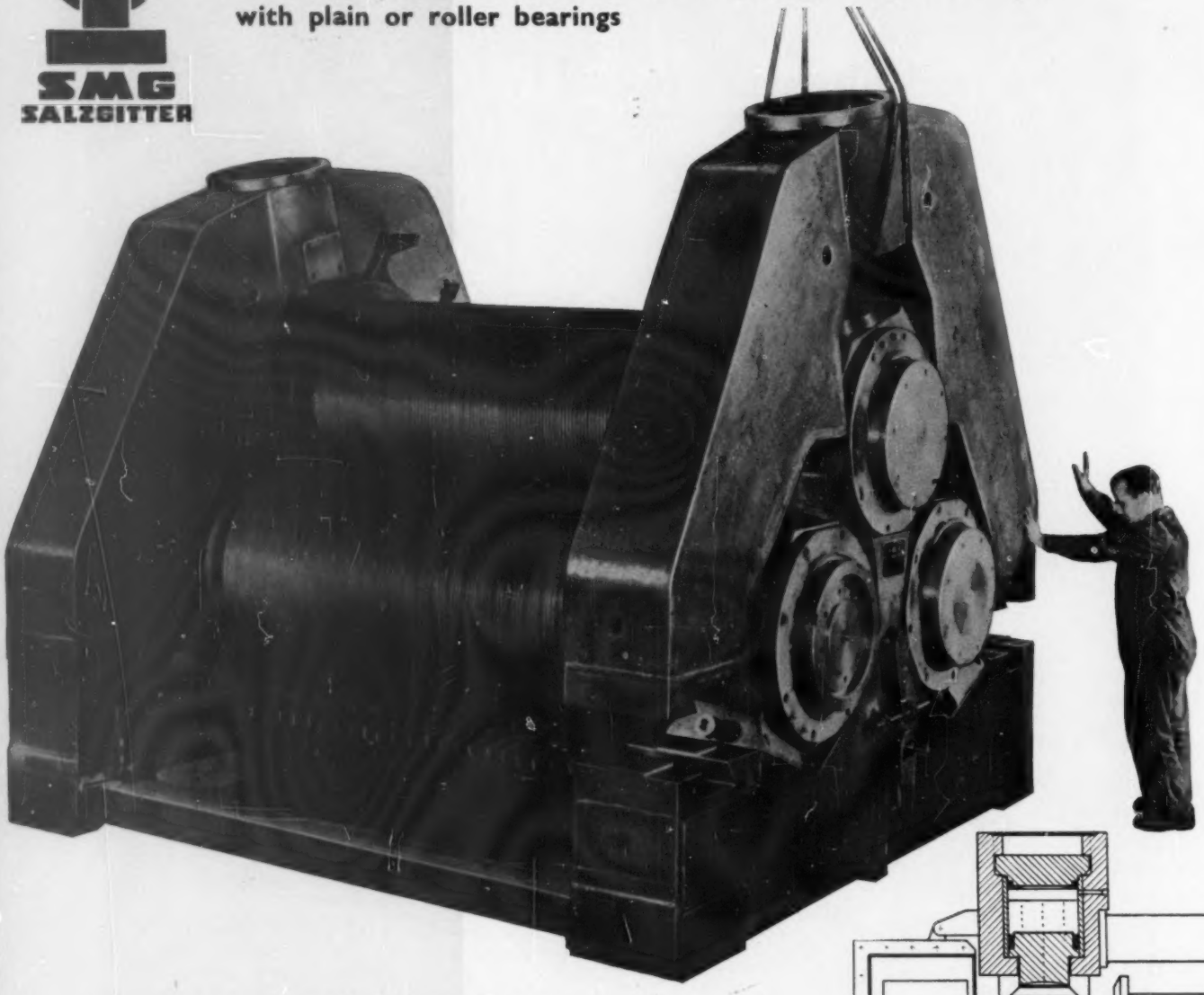
FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT, U.S.A.
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N.Y.

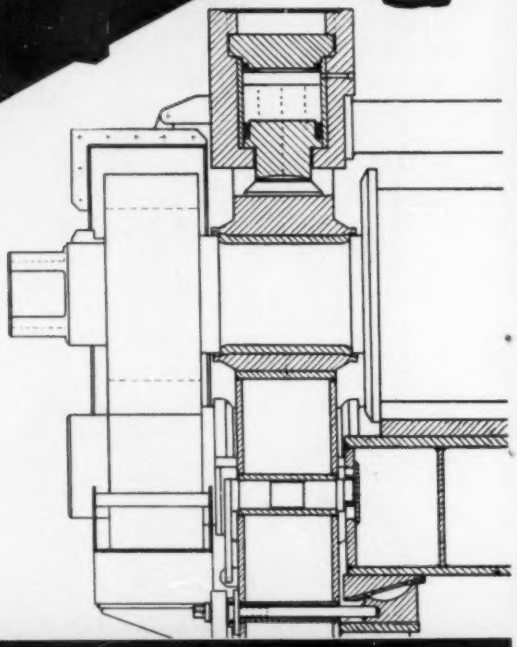
FARREL®

FB-1201

SMG
SALZGITTER

SALZGITTER
SUGAR CANE MILLS of most modern design
with plain or roller bearings

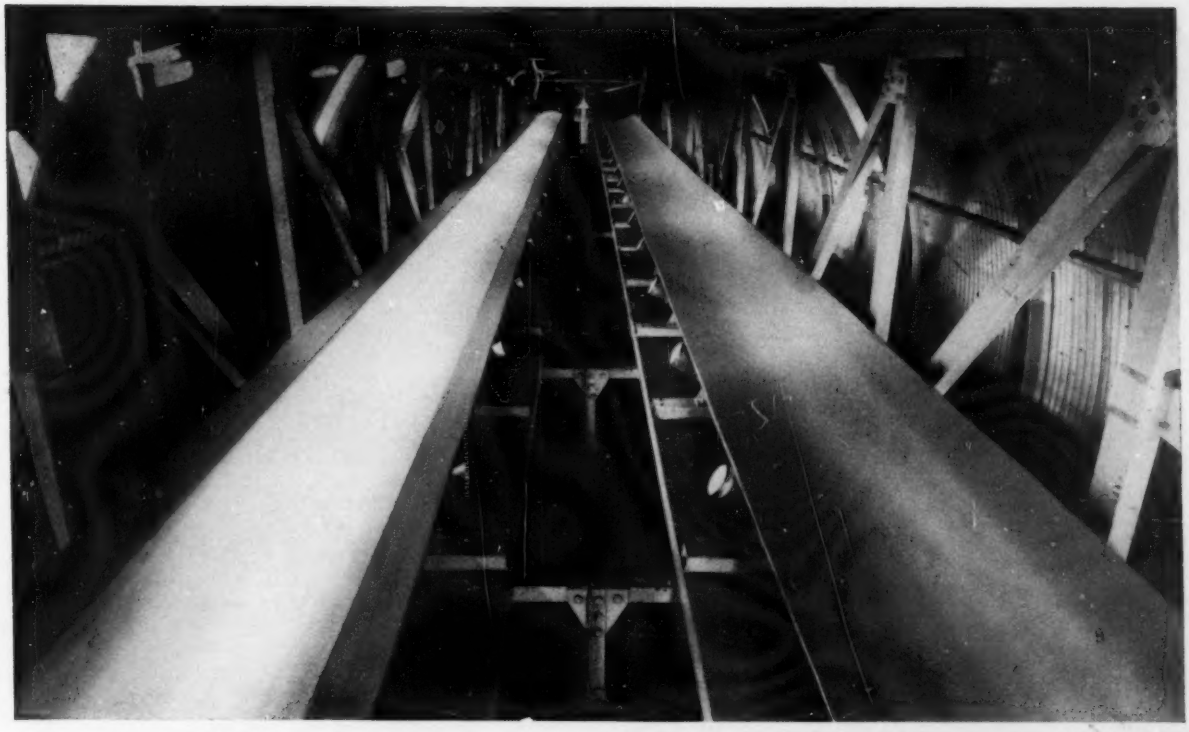




- **The two part mill headstocks can be quickly connected and disconnected by means of a keyed joint.**
- **Mill headstocks of all-welded construction offer maximum security against fracture**
- **Long working life through efficient anti-corrosion protection of surfaces in contact with juice.**
- **The smooth inside surfaces of the mill headstocks exclude the possibility of the formation of fermentation pockets**
- **Bagasse bridge with trash plate adjustments arranged outside headstocks**
- **Tilted or vertical hydraulic head**

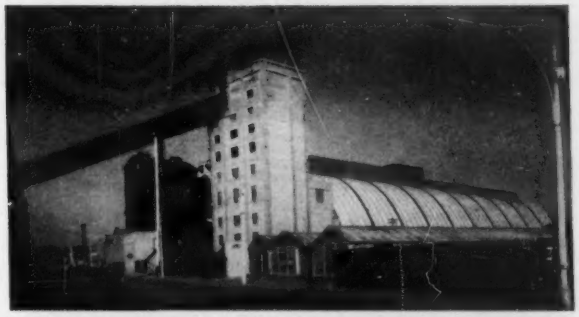
Expert advice from specialist engineers can be obtained from our technical service department.

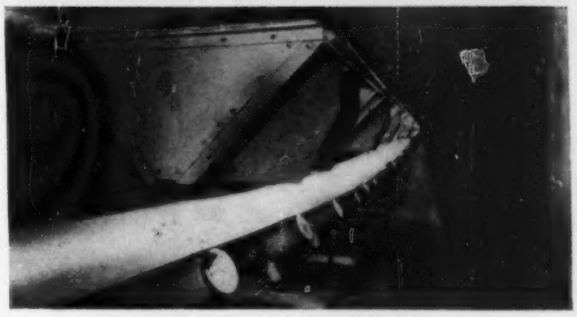
SALZGITTER MASCHINEN AKTIENGESELLSCHAFT
SALZGITTER-BAD (Western Germany)
3441
telex: samag sgtr 0953805
samag



SPENCER HANDLING PLANT SPEEDS THE FLOW OF SUGAR

The inclined gantry above and right, is equipped with two 42 in. Spencer troughed belt conveyors. One travelling at 400 ft. per minute handles 600 tons of sugar per hour and the other at 240 ft. per minute has an hourly capacity of 350 tons. Sugar is weighed by automatic weighers in the tower before being taken by other conveyors either to the vehicle loading tower seen in the background or into the 100,000 ton silo by two Spencer shuttle conveyors operating in the roof. Sugar is reclaimed from the silo by the 42 in. wide conveyor shown bottom right, which operates beneath the silo floor where it is fed by 42 hoppers and 4 travelling feeders.





(Pictures by kind permission of Messrs. Tate & Lyle.)

SPENCER

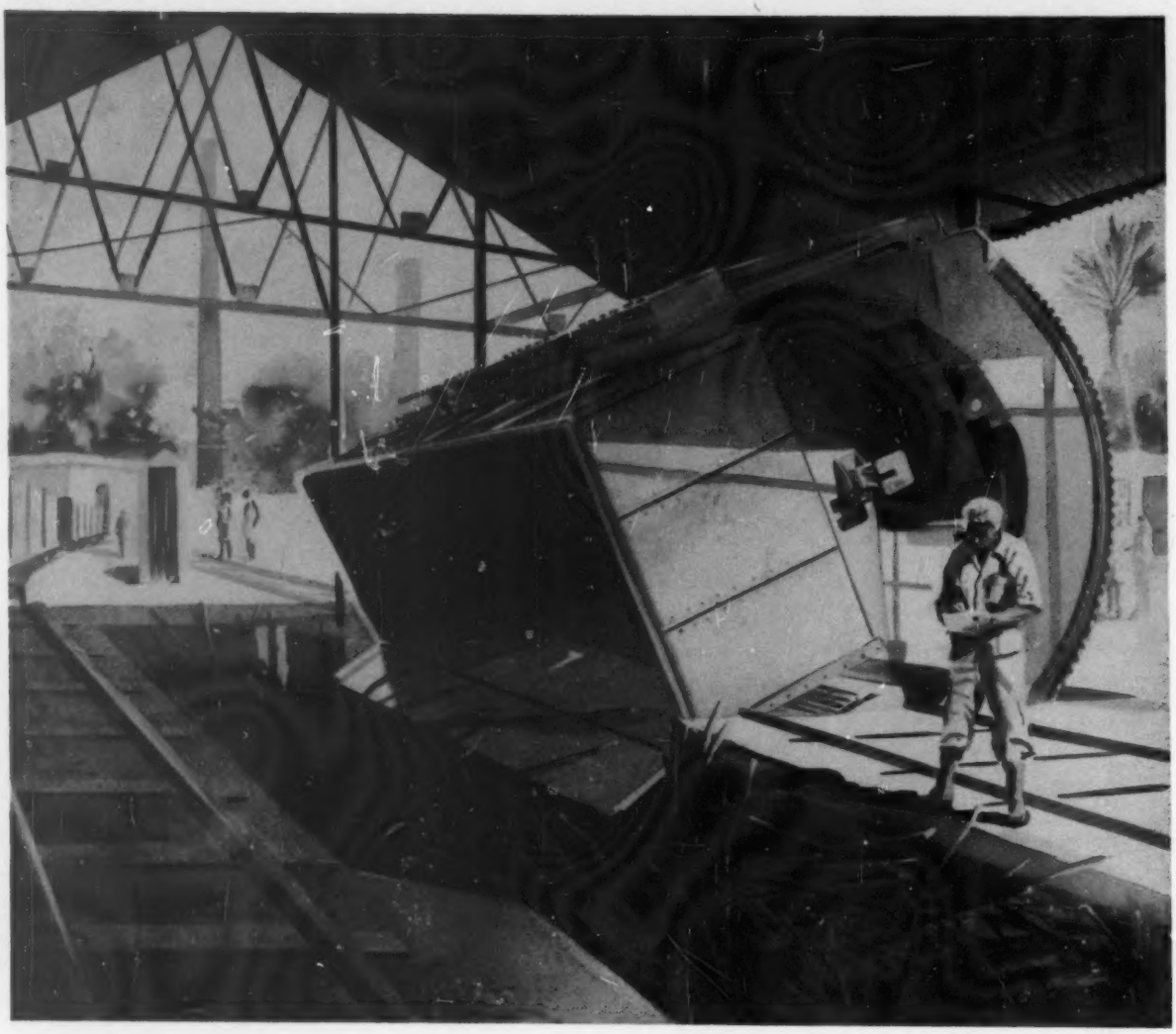
HANDLING PLANT

SPENCER (MELKSHAM) LIMITED · MELKSHAM · WILTSHIRE

Branch Offices:

Ingersoll House, 9 Kingsway, London, W.C.2. *Tel:* Covent Garden 1800. 34 Castle Street, Liverpool 2. *Tel:* Liverpool Central 3738.

St. James Chambers, 56 Church St., Sheffield 1. *Tel;* Sheffield 23838. 34 Great North Rd., Newcastle-upon-Tyne. *Tel:* Newcastle 26800



The S & H Cane Car Tippler in India

Unloading Cane

at Nellikuppam

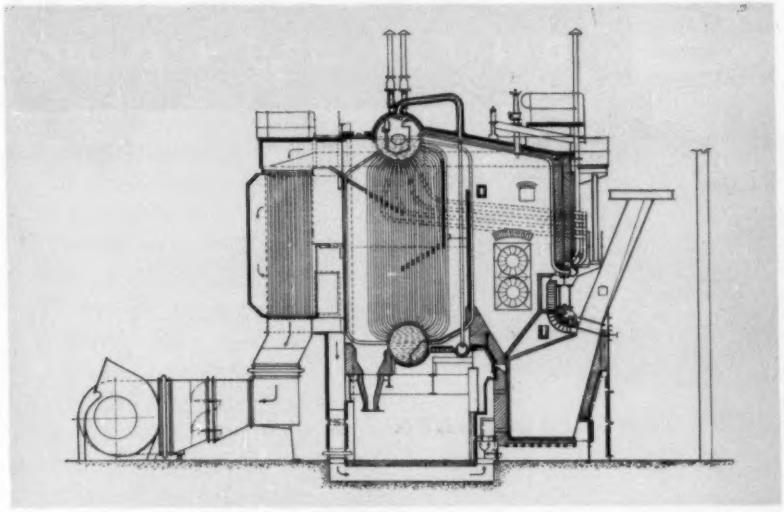
The Strachan & Henshaw Tippler, installed at the East India Distilleries and Sugar Factories Limited will tip, and unload 4-wheeled and bogie cane cars up to 36 tons gross in two minutes.

The cars are clamped automatically, leaving the open tops unobstructed, and the cane is emptied into a trench at the side of the track for conveyance to the crushing mills.

STRACHAN & HENSHAW LIMITED

STEELHOIST WORKS, BRISTOL 2, ENGLAND TEL. 78331

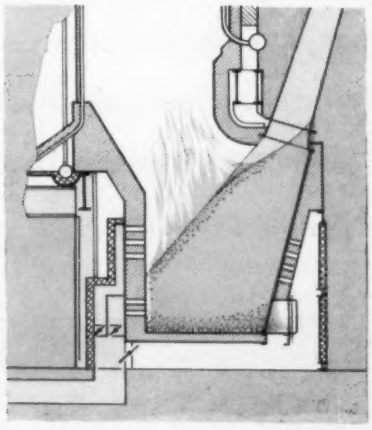
JOHN THOMPSON IN THE MEXICAN SUGAR INDUSTRY



The largest boiler in the Mexican Sugar Industry has recently been commissioned. It is a John Thompson 2-drum boiler, fitted with forced and induced draught fans, superheater and tubular air heater, incorporating Thompson – Eisner Bagasse Furnaces with auxiliary oil firing equipment.

JOHN THOMPSON WATER TUBE BOILERS LIMITED

WOLVERHAMPTON ENGLAND

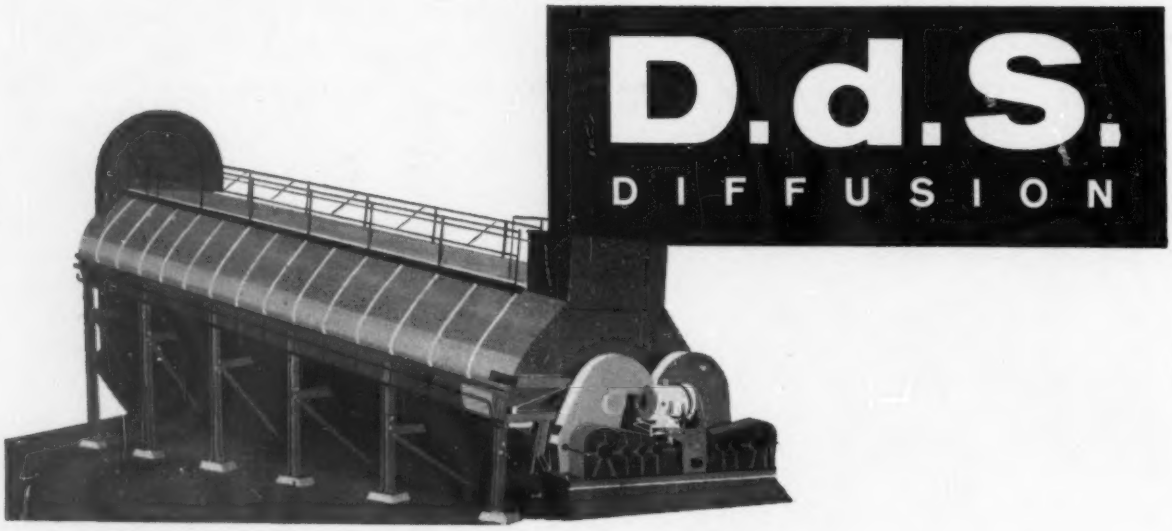


Thompson-Eisner furnace

WTB/11

The best result

is obtained by the



AKTIESELSKABET DE DANSKE SUKKERFABRIKKER
COPENHAGEN · DENMARK

The lowest investment

The cheapest maintenance

The lowest draft and pulp losses

The smallest fuel consumption

The best pulp-pressing

IN OPERATION ALL OVER THE WORLD

International Sugar Journal

VOL 62 *December, 1960* No. 744

Editor and Manager :
D. LEIGHTON, B.Sc., A.R.I.C.

Agricultural Editor:
H. MARTIN-LEAKE, Sc.D.

Assistant Editor:
M. G. COPE, A.I.L.(*Rus.*)

Panel of Referees

L. D. BAVER,
Director, Experiment Station, Hawaiian Sugar Planters' Association.

A. CARRUTHERS,
Director of Research, British Sugar Corporation Ltd.

F. M. CHAPMAN,
Technical Adviser, Tate & Lyle Ltd.

J. EISNER,
Technical Adviser, Booker Bros. McConnell & Co. Ltd.

P. HONIG,
Consulting Sugar Technologist.

J. CAMPBELL MACDONALD,
Chief Technical Officer, British Sugar Corporation Ltd.

H. C. S. DE WHALLEY,
Consultant, Tate & Lyle Ltd.

O. WIKLUND,
Swedish Sugar Corporation.

* * *

Published by
The International Sugar Journal Ltd.
Central Chambers, The Broadway,
London, W.5.
Telephone : EALing 1535
Cable : Sugaphilos, London.

Annual Subscription: 32s. 0d. or $5.00 post free
Single Copies: 2s 6d or 45 cents post free

PAGE

Notes and Comments 333
Commonwealth Sugar Agreement. Cuban sugar ownership dispute. U.S. sugar supplies for January/March 1961. Sugar and oil machinery pool for Cuba. Sir J. L. Hulett & Sons Ltd. Annual Report 1959/60.

* * *

Agricultural Articles:

The Mechanization of Beet Drilling and Monogerm Seed 335

Agricultural Abstracts 336

Sugar Cane Agriculture in Jamaica 337

Sugar Cane in the Philippines 338

* * *

General Articles:

An Abnormal Constituent of the Ash Content of Beet Sugar Factory Products (Part II) 339
Experiences in some B.S.C. factories in recent campaigns.
By William H. Parker, M.B.E., M.Sc.

A Routine Titrimetric Method for the Determination of Invert Sugars in Refined White Sugars 344
Using Ethylene Diamine Tetra-Acetic Acid.
By June Knight and C. H. Allen.

The Pressure Required to Feed Cane Mills .. 346
Part 1—Theoretical Considerations.
By C. R. Murry, B.E., A.M.I.E.(Aust.).

* * *

Sugar-House Practice 350
Method of operation and application of continuous centrifugals in the sugar industry. Is cleaning of evaporator surfaces empirical? Mud filtration through the "Fas-Flo" filter. Technical aspects of theoretical mill settings *etc.*

Beet Factory Notes 353
Effect of nutrient deficiency and virus yellows on respiratory losses of sugar in stored sugar beet. Work of the Hungarian Sugar Research Institute in the field of continuous juice extraction. Investigation of the scheme of multi-stage defeco-saturation *etc.*

Laboratory Methods and Chemical Reports 358
Determination of total fermentable substances and molasses payment. Characterization of white sugars with permanganate. Changes in the composition of sugars during storage of beet. Determination of moisture in sugar industry products *etc.*

Patents 361
Feeding devices for sugar centrifugals. Refining of sugar cane wax. Beet harvesters. Production of levan sucrase. Beet thinner. Producing *allo-iso*-citric acid by fermentation. Cane harvester with cutting apparatus.

Trade Notices 362
The "Dynoscreen" continuous screen type centrifuge. "Rodene" process timers.

Venezuela Sugar Statistics, 1954/59 363

Japan Sugar Imports 364

Stock Exchange Quotations 364

Brevities 363–4

Index to Advertisers lvi

Water Powered Centrifugals

WITH FLEXIBLE CONTROL FOR ALL GRADES OF SUGAR

Watson Laidlaw Water-Driven centrifugals are designed for consistent reliability and for ease of maintenance . . . no high degree of skill is required for normal upkeep and repairs.

Our "Super" High-Speed Water-Driven centrifugals can easily be adjusted to run at varying speeds, to suit the grade of sugar being treated.

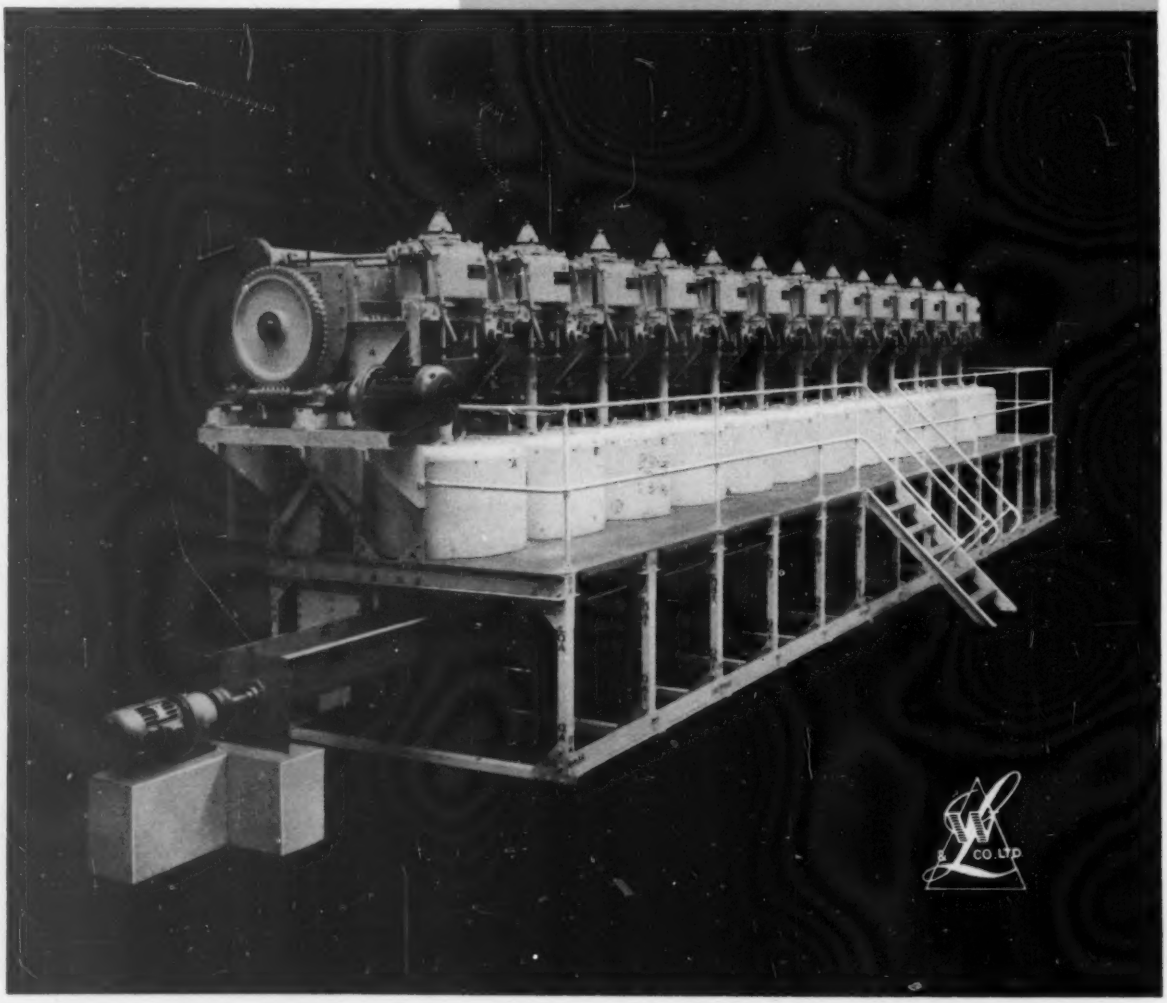
WATSON LAIDLAW
AND COMPANY LIMITED

Designers and Manufacturers of Modern Centrifugal Machines

98 LAIDLAW ST., GLASGOW, C.5.

Telephone: SOUth 2545 *Telegrams*: "FUGAL" Glasgow.

Illustration shows 13—36" × 18" water-driven centrifugals recently erected in our workshop prior to despatch to a sugar factory in Pakistan.



THE
INTERNATIONAL SUGAR JOURNAL

VOL. LXII DECEMBER, 1960 No. 744

NOTES AND COMMENTS

Commonwealth Sugar Agreement.

This year's discussions between the parties to the Commonwealth Sugar Agreement concluded on the 10th November, 1960. Discussions have taken place on the price to be paid for the 1961 negotiated price sugar bought by the United Kingdom under the terms of the Agreement and on other matters arising under the Agreement.

Full agreement was reached as follows:—

(i) *Price for* 1961;

The price to be paid for 1961 negotiated price sugar will be £45. 2s. 0d. per ton.

The negotiated price in recent years has been: £43. 16s. 8d. in 1958, £45. 2s. 0d. in 1959 and £44. 8s. 10d. in 1960.

(ii) *Negotiated Price Quotas.*

Negotiated price quotas for the year 1961 will be 5% above basic quotas.

Negotiated price quotas (*i.e.* the quantities of sugar bought by the Sugar Board on behalf of Her Majesty's Government at the negotiated price) are fixed under Article 15 of the Commonwealth Sugar Agreement which provides for an increase when United Kingdom consumption of sugar exceeds 2,550,000 tons. In 1959 negotiated price quotas were increased by 2½%, and in 1960 by a further 3% because sugar consumption was rising. For 1961 there is a reduction of ½% because figures of U.K. sugar consumption show a slight decline. The negotiated price quotas for 1961 are:

	Tons
Australia	315,000
British Honduras	18,900
East Africa	5,250
Fiji	126,000
Mauritius	351,750
South Africa	157,500
The West Indies and British Guiana	673,103
	1,647,503

(iii) *Duration of the Agreement.*

The Agreement has been extended for a further year and will now run to the end of 1968.

Cuban sugar ownership dispute.

Since the Cuban Government's nationalizations of sugar properties, allegations of their illegality have been made by some of the Companies concerned, and notice has been given that legal action would be taken against purchasers of sugar produced on the estates in question. Such a writ has been issued on behalf of the Cuban-American Sugar Mills Company for £247,000 damages against Tate & Lyle Ltd. alleging conversion of 9,500 long tons of raw sugar by accepting delivery thereof after its arrival in the Port of London on 21st October, 1960, in s.s. Crystal Gem from Puerto Padre in Cuba. Messrs. Tate & Lyle Ltd. have issued the following statement:—

> "A cargo of Cuban raw sugar has been delivered to us in the normal course of trading. Two rival parties, one American and the other Cuban, are now claiming that they are the rightful owners of the sugar and both are asking for payment to be made to them. We have made full provision for payment for the sugar as and when it has been decided by the courts which of the two parties is in fact the rightful claimant. As the matter is now *sub judice* no further statement will be issued."

* * *

U.S. sugar supplies for January/March 1961.

The U.S. Sugar Act expires on the 31st March, 1961. In consequence the Secretary of Agriculture is expected soon to issue a "Statement of Intentions" indicating the manner in which he will provide sugar supplies for the first quarter of 1961. The State Department has already indicated that it is not intended at the moment to grant Cuba an import quota next year and C. Czarnikow Ltd.[1] comment that, while this only "reiterated what had been generally accepted by sugar interests for some months . . . it was considered to be of some importance as it was the first such positive official announcement to have been made".

Lamborn & Co., estimating actual sugar needs in 1961 as 9,600,000 tons, have calculated the corresponding quotas applying *pro-rata* for January to March,

[1] *Sugar Review*, 1960, (481), 190.

1961, together with reallocations of the Cuban quota[2]. From these figures it is concluded that because a number of suppliers will not have a quarter of their sugar quotas available in the first three months of the year, the U.S. will have to authorize increased "non-quota" purchases for the Philippines, Dominican Republic, Mexico and any other "quota" countries which have adequate supplies available in the period, and will probably have to go to "non-quota" sources such as Brazil, the West Indies, etc. for still additional sugar.

The Department might prefer to announce initially a 10,000,000-ton or even 11,000,000-ton quota on the quarterly basis in order to secure the maximum from areas able to supply. Lamborn considers it grotesque that the vast U.S. sugar industry—running at almost $2,000,000,000 per year—should approach the coming year with virtually no knowledge upon which to judge the values of sugar for 1961.

* * *

Sugar and oil machinery pool for Cuba[3].

It is reported from Havana that a Canadian-British project to operate a "pool" of machinery, spares, chemicals and advisory services in Cuba for oil and sugar is at present under consideration by the Cuban Government. The sponsors of the pool are said to be prepared to invite West European concerns to participate by supplying such items to the pool for Cuba's needs.

Cuba would sell the pool sugar at current world price less the bulk purchase discount and 94-octane petrol at prices possibly permitting purchasers to undercut major international oil companies.

Price scales acceptable to the operators of the projected pool have already been agreed to by the Cuban Sugar Board and the Petroleum Institute. Purchases operating through the pool would be insured against the failure of oil supplies by a 50% monetary guarantee held in Swiss banks. In the case of an interruption of Cuban oil exports over a five-year period, it was envisaged that supplies to the pool might be maintained from "another world source" but this source was not disclosed. Cuba's output of oil refined from Russian crude is estimated at nearly 40,000 barrels per week more than the Island's own requirements.

* * *

Sir J. L. Hulett & Sons Ltd. Annual Report 1959/60.

Had it not been for the drought which occurred in Northern Natal and Zululand the results of the year under review would in all probability have matched those of the previous year, which was a record one for the Group. Unfortunately, this was not to be and the comparative sugar production figure for the Group amounted to 308,186 tons, a drop of 78,980 tons.

The industry's output of sugar has outstripped its markets and an industrial restriction of production has become necessary. Consequently, production for the next season will have to be reduced below even that of the 1959/60 season. The Group sugar quota in the Union of South Africa has been established, in the first instance, at a figure of 297,000 tons, which is approximately 11,000 tons below the production of the drought year 1959/60. It therefore becomes apparent that on the basis of the Company's position, relief to the industry can only be obtained by an increase in the price of sugar, and to this end representations have been made to the Department of Commerce and Industries.

The Company is possibly more fortunate than other members of the industry on account not only of its interests in Swaziland and Rhodesia, but also of its interests in paper manufacture through Ngoye Paper Mills (Pty.) Ltd. The Mhlume (Swaziland) Sugar Company Ltd. is now in full production and ought to contribute to the Group's profits in the ensuing season, It is also likely that Triangle Ltd., in Rhodesia, whose current crop is estimated at 20,000 tons of sugar, will make its contribution.

Until very recently the Group and the Tongaat Sugar Co. Ltd., as supplying millers to the refinery of Hulett's South African Refineries Ltd., have carried the responsibility of providing the major proportion of the country's requirements of refined sugar, one effect of which was to avoid the necessity for the importation of refined sugars. In doing so they have had to bear the higher cost of converting cargo sugar through a central refinery, as against the less expensive process of manufacturing a direct consumption sugar at mill. The present price structure of sugar is such that the refinery is only able to recoup its higher cost of manufacture at the expense of its supplying millers. As a result it is unable to offer a price sufficiently high to continue to attract supplies of outside raw sugars.

The directors of the refinery have been giving this matter serious consideration. In an endeavour to rectify this position they have now opened up negotiations with the Department of Commerce & Industries as it is felt that the future of the refinery now depends upon Government intervention. If these negotiations are successful the Company can look forward to receiving a realistic price for its raw sugars.

Subsidiary companies.—The cane supplied by growers under agreement to Delville Estates Ltd. and crushed at the Group's mills in the Union amounted to 463,302 tons as compared with 609,296 tons the previous season.

Ngoye Paper Mills (Pty.) Ltd. enjoyed a most successful year's trading, the output of 21,991 tons of paper constituting a record for the company.

The Mhlume Mill of Mhlume (Swaziland) Sugar Co. Ltd. opened officially on the 5th May 1960 and is now in regular production.

[2] *Lamborn*, 1960, **38**, 219, 224.
[3] Public Ledger, 12th November 1960.

THE MECHANIZATION OF BEET DRILLING AND MONOGERM SEED

TWO of the outstanding post-war developments in sugar beet cultivation are the extent to which the operation of drilling has been mechanized and the production of improved varieties.

The objective of the first is to cut out or, at least, minimize the amount of hand labour used in singling. The drills which have been evolved for the purpose are commonly termed "spacing drills," but there is a certain vagueness and confusion about this term. In former times beet seed was sown in a continuous line and "singled," with the result that the plants were "spaced" at a distance of approximately 9 inches. Spacing now means the deposition of seed at that interval and is referred to below as "group spacing." Latterly the term has been applied to the sowing of a continuous row in which the seeds are spaced at intervals of some 2 inches, termed below "line spacing," with sufficient regularity to enable the operation of singling to be mechanized.

With the latter interpretation of spacing two implements, the drill and the gapper, become essential and an added capital charge is thereby involved. The amount spent in this development as judged by the number of implements designed by different makers, must be very large.

The concurrent development in breeding was preceeded by the practice of "shearing" or, later, decortication, by which the clusters, normally containing 2 to 5 seeds, were broken down but, in the process, too large a proportion of the seed became damaged. The breeding programme has followed two lines. The first merely aims at improvement primarily of yield but, secondarily, of sugar content and male sterility. It is a programme recently described by S. ELLERTON[1] and need not be further considered here for it does not bear on the problem of mechanization. The second aims at the production of monogerm seed, thus avoiding the damage caused by breaking down the multigerm cluster. It now seems likely that the monogerm seed will soon be available in commercial quantities[2] and that, through its use, the problem of singling will be finally solved for, even with line spacing, planting and the use of a gapper, a large percentage of the stand left, arising as the seedlings do through the germination of 2 or more seeds in a single cluster, will be composed of 2 or more closely apposed seedlings. The hope has even been expressed[1] that, with the advent of monogerm seed, spacing in its original sense of group spacing will become a practical proposition though this is qualified by a demand for high germination and weed-free land. It has even been claimed that, with the advent of monogerm seed, singling will be eliminated[4].

In the above there appears to be a certain confusion of thought arising from failure to recognise certain controlling factors. The first of these is that of seed viability. Germination of commercial seed (clusters) may average around 75–80% but can be considerably lower. A very simple calculation will show that, at 75% germination and making no allowance for seedling losses from pests and diseases, at least 3 clusters must be sown per group to approach a 100% stand. Losses from pests and disease will vary widely and be difficult to estimate; it is interesting to speculate whether there may not be less in a spaced crop. Thus the wire-worm, which can cause considerable damage where it follows along a continuous line, will be hard put to it to know in which direction to turn when it has demolished one group!

It follows from this fundamental consideration, which will apply equally with the use of monogerm seed, that singling can not be eliminated entirely, but that the layout can be much reduced if those 3 to 4 seeds, necessary to give a full stand, are not placed too close. Under this system in group spacing the 3 to 4 seeds would be scattered over 3 inches in the line with 6 inches unsown between the groups. Among the seedlings, in a vast majority of the groups, there will be found one which, by its isolation, is more vigorous, and permits quick chopping out of the remainder.

It was with these fundamental considerations in view that an early, if not the first, group spacing drill was designed[5] and put to regular commercial use throughout the war. The records of those commercial sowings showed a saving of two-thirds seed (3 inches sown and 6 inches missed), a variable (average 33%) saving of labour in singling and an increased yield of between 1 to 4 tons per acre, explainable on the basis that most of the crop seedlings, being undisturbed during singling, became deep-rooted relatively early and withstood drought better—it was noteworthy that the largest increases were obtained in dry seasons.

The second controlling factor is weed growth; the continuous line stands out, interculture is easy and singling costs only slightly enhanced. Under group spacing this is not so; difficulty in identifying the seedlings among the weeds will increase these costs and even make singling impossible. A notable instance occurred when a trial commercial crop was autumn sown at some 3 feet spacing with the objective of eliminating the cost of spring planting of stecklings. The first year's trial was so successful both in saving that cost and in increased yield of seed that, in the following year, an intense demand arose, but fortunately resisted, for the hire of the drill to sow extensive areas,—fortunately, because unseasonable harvest weather combined with labour shortage led to the omission of the standard autumn hoeing

[1] *I.S.J.*, 1958, **60**, 347.
[2] *Spreckels Sugar Beet Bull.*, 1960, **24**, 26.
[3] *Farmers Weekly* (*London*), 1960, **53**, (4), 87.
[4] *Farmers Weekly* (*London*), 1960, **53**, (5), 40.
[5] *I.S.J.*, 1937, **39**, 56; 1938, **40**, 60.

and, by spring, the beet seedlings were completely swamped by weeds. The same may happen occasionally even in spring sowing and, to meet such cases, as also to permit sowing of such crops as mangolds, kale and all brassicas, a flexibility was introduced which enabled it to sow all classes of seed, both group spaced or in continuous lines. Recent developments in weed control, then non-existent, may, it is true, offer a solution to this problem of group spacing.

It would seem that the question of spaced drilling is ripe for reappraisal in the light of the above fundamental considerations.

With the 3 to 4 seedlings of a group scattered over 3 inches of the line, all derived from monogerm seed, final singling will be much simplified. This, combined with weed control, brings group spacing within the orbit of practical politics. It appears, therefore, worth while recalling these early experiences with a group spacing drill which, owing to the war, never reached commercial production. On the economic side there would be the differential seed rate (4 lb as compared with 8 lb in line spacing) and the reduction of capital costs resulting from the elimination of the gapper. Further economy would result if the drill, like that earlier model, were made flexible by adaptation to sow, beside beet, mangolds, kale and brassicas, either spaced or in continuous line.

H. M.-L.

AGRICULTURAL ABSTRACTS

Fire fighting fog nozzle is new approach to sprinkler irrigation. G. Y. EWART. *Sugar Research and Management Newsletter* (Hawaii), 1960, **2,** (3), 1.—By use of this nozzle on a mobile fire fighting unit carrying a diesel driven centrifugal pump, cost per acre can be reduced from the present $250–$1000 for conventional methods to approximately $100.

* * *

Time of harvest and yields at Houma, 1953-1956. L. P. HEBERT *et al. Sugar Bull.* (Louisiana), 1960, **38,** 215–219.—The use of varietal selection to meet the dilemma of cutting immature cane or of risking loss through frost is discussed.

* * *

A comparison of urea with ammonium sulphate as a nitrogen source for sugar-cane. D. H. PARISH and S. M. FEILLAFÉ. *Trop. Agric.*, 1960, **37,** 223.—While both sulphate of ammonia and urea up to 45 kg N per acre led to increasing yields, the relative differences were highly significant in favour of the former. Loss of N due to volatilization, more rapid nitrification with leaching of nitrate, and toxicity through formation of biuret or ammonium cyanate are offered in explanation.

* * *

The effect of soil type and soil moisture content on growth of sugar-cane in the East Coast of Demerara. B. WALKER. *Trop. Agric.*, 1960, **37,** 227–233.—From the wealth of data assembled on such characters as field capacity, permanent wilting point and soil densities, the volume of water available to the plant is calculated for the 4 main types of soil of the Demerara East Coast. Water loss by evapotranspiration is determinable from data obtained from open-pan evaporimeters. From these, it is suggested, irrigation requirements can be calculated.

Sugar-cane trials in Morocco. G. GRILLOT. *Bull. Soc. Agric. Maroc.*, 1957, (77), 21–29; through *Plant Breeding Abstracts*, 1960, **37,** 2942.—New attempts are being made to establish sugar-cane plantations in Morocco using the early, drought-resistant varieties POJ 2725, POJ 2727 and Co. 290 and the moderately early Tuc. 1376. Varieties resistant to relatively low temperatures are also being sought.

* * *

Cytological studies of sugarcane and its relative. XV. Basic chromosome number of *Saccharum officinarum* L. H. W. LI, K. C. SHANG, Y. Y. HSIAO and P. C. YANG. *Cytologia, Tokyo* 1959, **24,** 220–236; through *Plant Breeding Abstracts*, 1960, **30,** 2944.—Probably *S. officinarum* with $2n = 80$ arose through hybridization between two unidentified species with $n = 5$, autopolyploidization and consequent segmental allopolyploidy, and further autopolyploidization, twice in succession.

* * *

The effects of tropical cyclones on the sugar crop in Mauritius. III. A. D. SWAN. *Rev. Agric. Sucr.* (Mauritius). 1960, **39,** 57–60.—The article gives the latest mathematical interpretation of the effect of cyclones on the sugar crop and follows two earlier articles.[1]

* * *

The years of reputed drought. A. D. SWAN. *Rev. Agric. Sucr.* (Mauritius), 1960, **39,** 151–154.—A discussion of the difficulties attendant on finding any generally acceptable definition for the word "drought." This is shown to be particularly difficult in the case of sugar cane with its different seasonal requirements and is illustrated by reference to the wide variations in net deficiency in yield, ranging from 0 to 32%, in years of declared drought.

[1] *I.S.J.*, 1958, **60,** 222; 1960, **62,** 122.

Simazine

A new departure in weed control

One single pre-emergent application keeps young cane weed-free for months

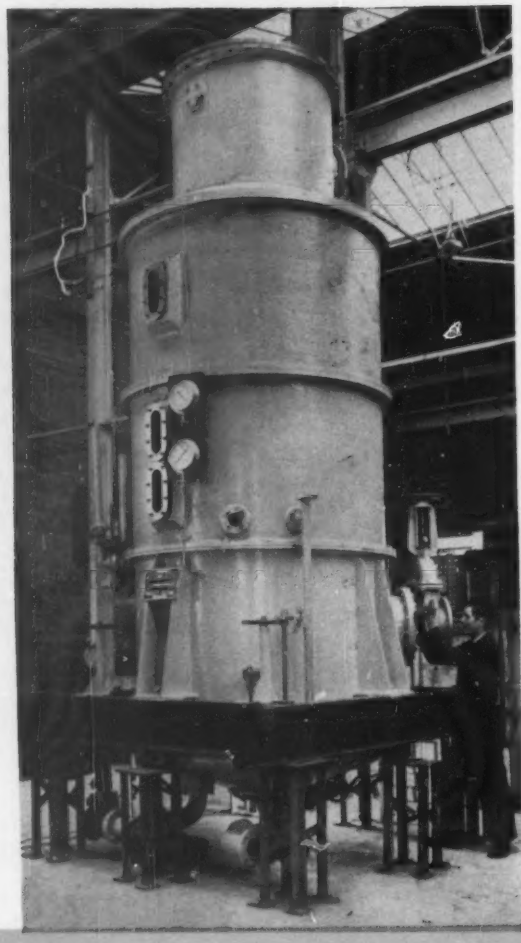
persistent selective safe

Simazine products for weed control in sugar cane are available

in the USA and Puerto Rico through the distributors of Geigy Agricultural Chemicals, Ardsley, N.Y., as **Geigy Simazine 80 W**

in Central and South America, Cuba, Haiti, the Dominican Republic, South Africa, the Philippines and Taiwan through the local distributors of J. R. Geigy S.A., Basle (Switzerland), as **Gesatop 50 W**

in the British Commonwealth (other than Australia) through Fisons Chemicals (Export) Ltd., 95 Wigmore Street, London, W1, as **Simazine 50 W**



Evaporators by

*CRAIG

* manufacturers of machinery for Complete Sugar Factories

This illustration shows a sugar factory in India. The complete mechanical equipment for this factory was supplied by Craig.

Your enquiries will have our prompt attention.

A. F. CRAIG & COMPANY LIMITED

Head Office and Works: Caledonia Engineering Works, PAISLEY, SCOTLAND
Telephone: Paisley 2191 Telegrams: Craig, Paisley

London Office: 727 Salisbury House, London Wall, E.C.2 Telephone: National 3964

SUGAR CANE AGRICULTURE IN JAMAICA

19th Meeting, Agricultural Section, The Jamaican Association of Sugar Technologists, 1958[1].

THE major subject under discussion was the general decline in yield closely associated with which is the changing varietal situation. The latter is indicative of the reality of the former and is described by C. E. M. SMITH. In the 7 year period 1952–1958, the % reaped acreage of the favourite cane B 34104 has fallen from 48 to 4 and that of B 3439 from 22 to 4. In contrast the same figure rises, in the case of B 41227 from 1 to 34 and of B 4362 from 1 to 25. These changes are emphasized when the plant cane acreages are compared. These latter figures, given for each regional area, show, however, wide varietal regional differences. Thus in the Dry North region the plant acreage of Co 331, a variety grown in no other region, is 31%; the figure for B 41227 ranges from 54% in the irrigated tract to 16% in the Wet East and the figures for B 4362 from 55% in the Wet West to 15% in the irrigated tract. The only other variety of importance is B 42231 with a stationary acreage of 11%, but it is highly specialized and limited to saline irrigated areas. This varietal position is recognised as dangerous and the paper ends with a brief review of later varieties now under trial.

The causes of a yield decline on part of Worthy Park are discussed by R. F. INNES *et al.* The decline was observed particularly on deep, free-draining, silty, alluvial loam which had been under cane since 1918. In 1955 the combined beds were levelled off and Louisiana banks with 6 ft base substituted. The cane in every fourth row, that over the filled-in drain, was conspicuous for its poor growth and light green colour. The symptoms included severe physical root damage with, at times, much pink wound staining. Much of the paper is devoted to a description of remedial measures, either soil fumigation with D.D. prior to planting or "Chlordane" combined with resistant varieties. Though the symptoms are suggestive of parasitic damage no evidence of root disease was apparent nor of parasitic soil organisms, in particular, nematodes, in abnormal numbers.

The presence of ratoon stunting disease in Jamaica, first reported by D. R. L. STEINDL in 1953, was later confirmed by C. E. M. SMITH who, with P. D. MANSER, describes later work involving tests through inoculation with subsequent hot water treatment. Inoculation of Co 421 resulted in a loss of yield proportional to the intensity of the symptoms but visual examination is inadequate for determining freedom from disease in setts. In 23 varieties inoculation produced depressions of yield ranging from 28% to —11%, while heat treatment (52°C for 1–1½ hrs) resulted in yield increases ranging widely from 25% to —18%

A preliminary outline only is given by P. E. RÖHRIG of the determination of the factory losses incurred through borer damage.

A paper by J. D. AUGHTRY shows the remarkable differences in yield of ratoon crops according to date of the cane growth period as also their differences in response to N. Five growth periods were studied commencing 15 January, 1 March, 15 April, 1 June and 15 July respectively, and all of 12½ months' duration. One outstanding feature was the decreasing tonnage per acre in the unfertilized plots from 50·19 in the earliest crop to 22·66 in the last. Although the earliest crop has the lowest sucrose content in juice, its sugar yield at 6·43 tons per acre on the unfertilized plots, surpassed the yields of the successive treatments by 1·12, 2·28, 2·88 and 3·38 tons per acre, indicating the importance of the growth period on yields.

Another unexplained feature of the sucrose position was that the N dressing produced only a nominal response in the case of the earliest crop, while the successive increases in the later periods were 1·27, 1·53, 1·66 and 1·00 tons. To sum up: seasonal factors have a marked influence on crop yields probably because April-October is the season of maximum stem elongation of which the earliest crop is capable of taking the fullest advantage. The study includes a wealth of crop-log data.

The relative positions of sulphate of ammonia and urea from the economic aspect are discussed by H. M. THOMPSON. The comparative tests quoted show a minimal, and quite insignificant advantage in favour of the former, which has also a stronger acidifying effect on the soil which may be cumulative. The decisive factors, thus, will be such factors as transport and storage charges. The former are stated to be approximately half for urea which, however, being highly deliquescent, requires special packing and storage.

Jamaica, as elsewhere is turning to mechanization and an account of developments in Natal is given by E. STEWARD. J. T. EDMOND describes additions to a 2-furrow plough whereby a marker is attached and adaptations are made to enable it to serve the purpose of a planter. Trials indicate labour costs to be reduced from approximately £4. 17s. to £2. 8s. per acre.

H. M.-L.

Paraguay sugar prospects[2].—As compared with first estimates published after the frosts last May, the 1960 crop prospects are considerably improved. Production is now expected to reach 26,000 tons which is, however, below that of 1959. Of this quantity, some 6000–8000 tons will be available for export and the Government is said to be interested in acceding to the International Sugar Agreement in the hope of a supply quota for the U.S. market.

[1] *Jamaican Assoc. Sugar Tech. J.*, 1958, **22**, 1–33.
[2] F. O. LICHT, *International Sugar Report*, 1960, **92**, (9), 90.

SUGAR CANE IN THE PHILIPPINES

Proceedings of the 6th Annual Convention, Philippines Sugar Technologists, 1958.

THE record, covering nearly 350 pages, is too voluminous for any detailed report of the individual papers, but the basic setting is this. Before the war, when the industry was practically wiped out, the Islands' production of sugar was approaching a million tons. Following the war production rose, first rapidly and then steadily, till it reached 1·38m tons in 1958/59. This recovery, to surpass the pre-war mark, was primarily due, in the early years, to an increased acreage, but an increased average field production from 73 piculs sugar per ha in 1949-50 to 92 piculs in 1956-57 and an expected 106 in 1957-58 has supplied its quota. For the attainment of such results those responsible are to be congratulated but, as F. T. TABAYOYONG stated in his address, they do not offer grounds for complacency. The Hawaiian figure, allowing for the 22 months crop, works out at well over 200 piculs per ha per annum, but Hawaii is exceptional as it has 60 years of steady and intense research and experiment to guide it. More comparable is Taiwan with 150 piculs and Queensland with 140 piculs.

This problem is discussed in several papers dealing, under 2 main heads, with the soil and its nutrient requirements and varieties. But the problem is also economic for, as F. A. PINEDA shows for Pasudeco where cane yields are only some 35 tons per ha and the major causes are known to be very low content of organic matter, need for CaO dressings (pH 4·5–5·5) and low K, but the planters are not in a position to buy even the lime. A series of papers describe experiments designed to determine the major fertilizer requirements. The major deficiencies throughout appear to be potash, lime and organic matter. The first is dealt with in a complex variety × fertilizer experiment described by F. T. TABAYOYONG and F. A. BASILA and, more particularly, by the former in "On quantities of potash fertilizer" in which he shows that the effect of K is linked with the correction of the pH on these acid soils. Two papers deal specifically with the question of lime, the first by R. T. MARFORI in the case of the Canlubang estate and the second by F. A. BASILA. The results, while confirming the importance of lime, attribute the varying results to limits imposed by other factors. This limitation is also shown by F. T. TABAYOYONG in "Fertilization according to soil type." The rôle of calcium is also discussed by M. ROBENIOL under the title "The buffering capacities of soils in the Victorias milling district." Between pH 3 and pH 5 a sharp rise in pH takes place on the addition of carbonate, and a diminishing rise up to pH 6·5. Thereafter there is no rise. Nitrogen is briefly dealt with by J. K. DEMETERIO *et al.* They put forward, on laboratory experience, a formula which has been subsequently applied on the plantation scale, the measure adopted being relative profit.

Several papers on more general agricultural aspects were also read. E. P. VILLAREAL and O. SANTOS using "Gibrel," a K salt of gibberellic acid, found significant increased stalk elongation but a reduction in yield both of cane and sugar which was not, however, statistically significant. The prospect of using mature cane for silage is discussed by V. C. CALMA *et al.*, the cane used being the seedlings remaining after selection.

Varieties

In addition to the record of varietal response in the variety × fertilizer experiment noted above, the quality ratios of seven varieties are compared by A. R. APACIBLE. Correlation studies of certain agronomic characters of seedlings propagated asexually in April and again in January are given by M. T. ILAGA and V. C. CALMA. Highly significant correlations were found between stooling capacity and stalk diameter only.

A cursory review of the variety experiments conducted in the Victorias milling district during the seasons 1956/57 and 1957/58 is given by F. T. TABAYOYONG and I. P. FERRARIS and the effect of artificially produced lodging in H 44-3098 on the production of suckers and bull-shoots by J. T. TAPAY; no direct effect was found, even on yield. The same author describes experiments to control flowering in sugar cane varieties, classed as early, medium and late flowering, by photoperiodic control and by application of CMU; 4 lb/ha of the latter appeared to induce flowering in Co 475 (late) and in H 32-8560 and H 39-3633 (medium).

Pests and Diseases

Three borers occur in the Philippines, *Diatraea infuscatella*, *Argyroploce schistaceana* and *Sesamia inferens*. The two parasites *Trichogramma australicum* and *T. japonicum* have only recently been released in quantity—some 368 m. in the first 6 months of 1958. The results, recorded by P. PORQUEZ, show a reduction of infestation from between 17% and 26% to some 5%.

The capacity of nematodes to reduce cane yields has only recently come to be realised and R. I. CAPINPIN gives a brief note of observations so far made.

J. R. RIVERA and M. E. LOPEZ describe, mainly from laboratory studies, the morphology and physiology of the perfect stage of red rot and M. E. LOPEZ and J. R. RIVERA add observations on smut with a note on differential varietal resistance.

H. M.-L.

AN ABNORMAL CONSTITUENT OF THE ASH CONTENT OF BEET SUGAR FACTORY PRODUCTS

Experiences in some B.S.C. factories in recent campaigns

By WILLIAM H. PARKER, M.B.E., M.Sc.
Chief Chemist, British Sugar Corporation Ltd.

PART II

STUDY OF POTASSIUM IMIDO-DISULPHONATE (IDS) IN THE PROCESS DURING THE 1957/58 CAMPAIGN.

Summary and Conclusions

WITH untreated battery supply water nitrites are generated freely in the diffusion process and appeared in the raw juice in these investigations in concentrations of up to 20 p.p.m. (as N), passing forward to the 2nd carbonatation filtrate unchanged.

When formalin dosing of the battery was practised the production of nitrite was much reduced, and its point of generation appeared to have been pushed forward to the 2nd carbonatation stage. There is some evidence that, at this stage, some nitrite was formed by the oxidation in the 2nd carbonatation of an intermediate nitrogen compound.

During this period of high formaldehyde dosing and low nitrite concentration it was noticed that there was a striking reduction in the quantity of IDS crystals in the middle and low product sugars.

The nitrite reaching the sulphitation station via the 2nd carbonatation juice was converted into IDS by the action of the SO_2.

The IDS crystallized first in the after product massecuites during boiling and was normally voided in the molasses until the increasing concentration and crystal size caused the crystals to be retained in the after-product (A.P.) sugars. At this stage a feedback to the white pans occurred, and later, by similar mechanism, a feedback from the middle product sugar. This increased the concentration of the IDS so much that it began to crystallize with the white sugar.

The concentration of IDS was kept below the danger level (i.e. danger of crystallizing with white sugar) *by returning the A.P. sugar to the raw juice. This prevented the first feedback and kept the white sugar at the normal ash level.*

The capacity of the ordinary lime/CO_2 defecation to free the A.P. remelt from IDS appears to be limited, but was always able to achieve its purpose during the campaign.

The necessity to return the A.P. sugar to the defecation was judged according to the amount of IDS crystal in the A.P. and M.P. sugars as determined by daily microscopic examination. Experience has shown that the safest course is to recirculate the A.P. sugar when IDS crystals first appear in the middle product sugar.

The technique of the microscopic examination is described; and a method of determining dissolved IDS in juices is given.

DETECTION OF IDS IN THE SUGAR END

The most convenient and reliable method of detecting IDS in the sugar and of anticipating its appearance in the white sugar is undoubtedly the microscopic examination of the middle and low product sugars. To make the examination all that is necessary is to place a few crystals of the sugars on a glass slide, add a spot of slightly under-saturated KCl solution and examine with a low power (×5 or ×10) microscope (about 1 in objective). The sugar crystals will be seen to dissolve while the IDS crystals remain unchanged or dissolve only very slowly.

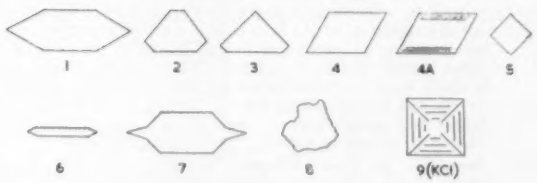


Fig. 1.

Fig. 1 shows the forms in which IDS crystals are seen under the microscope. No. 1 is the most symmetrical shape, but variation of side length produces all the forms 2–6. All these occur as thin plates when they are small but when more growth has occurred the parallelogram shape (4) seems to dominate, and growing size is indicated by the shadows along the sides (4a). The presence of the dark border shadows should be taken as a danger sign, for they show that there is a thickening of the crystals and therefore a greater concentration of IDS than in the case of flat crystals.

The curiously distorted form (7) appears characteristically in the cold white massecuites which are rich in sulphonate. Their presence indicates that the sulphonate is dangerously near to crystallizing in the white sugar.

If the crystals appear ragged or shapeless (8) it may mean that excessive washing during spinning

has started to dissolve them, or that the mother liquor in the pan has become under-saturated with respect to IDS during the latter part of the boiling through the taking in of syrup with a lower sulphonate content.

Confirmatory test.—If a spot of concentrated KOH is added to the sugar and KCl mixture on the slide the IDS crystals will be seen to dissolve readily, forming the tri-potassium salt $KN(SO_3K)_2$.

If the spot under observation is left some time box-like crystals of KCl form (9), but the viewer is not likely to confuse them with the IDS.

The significance of microscopic appearances.—If the IDS crystals in the A.P. sugar are small and scanty there will be no fear of contamination of the white sugar. If they are in large numbers special watch should be kept on the middle product (M.P.) sugar. If the M.P. sugar shows a small amount of IDS the white massecuite may be able to tolerate the concentration but it is safest to take preventive action at this stage (see below). If the M.P. sugar shows large or numerous crystals, and if the cooled white massecuite shows the pipette shaped crystals (7), the situation may be regarded as dangerous.

Rapid chemical test for IDS in white sugar.—White sugar which is contaminated with IDS gives a flocculent white precipitate when shaken with 2–3 times its volume of clear dilute basic lead acetate solution. The precipitate is hardly visible if the IDS is less than about 0·03% of the sugar. (The BLA solution is prepared by diluting the ordinary strong solution about 5 times with distilled water and allowing the mixture to stand several days to settle the turbidity.)

Testing for IDS in white sugar when the ash is only slightly over normal.—It is not an unusual experience in factories that the white sugar ash remains for extended periods at a consistently higher level than the desirable maximum. If, in such circumstances, the IDS in the sugar end is judged by microscopic inspection to be absent or of low concentration it would be a safe assumption that the high ash was due to something other than IDS but if on the other hand the IDS concentration in the sugar end is fairly high, it is then most important to know whether or not the excess ash is due to IDS. The test described below will detect IDS in white sugar when the concentration is as low as 0·005% (as sulphated ash).

Procedure for Test.—Dissolve 20–30 g of the sugar in about an equal amount of distilled water; add about 1 ml each of HCl (1 to 3 by volume approx.) and barium chloride solution (10% approx.) and a few crystals of sodium nitrite; warm and stir. An immediate precipitation indicates a high concentration of IDS; low concentrations produce a turbidity on standing. The sensitivity is about 0·005% (as sulphated ash). (*Note:* Sulphate will, of course, also give this reaction, and though it is unusual to find sulphate present to the extent of causing interference, it is as well to make sure that this is the case by treating the sugar solution in the cold with a little $BaCl_2$ solution; if no turbidity develops in 5 minutes it may be taken that there will be no interference from sulphate.) Sulphite present in the sugar will be oxidized to sulphate by the nitrous acid in this test, but the concentration will normally be so small as to make interference negligible.

Summary of the properties of potassium imidodisulphonate

As the description of IDS and the allied compounds are found only in the more advanced text books on inorganic chemistry a few of its most important properties are given below.

1. Crystallizes in lozenge-shaped tablets: slightly soluble in cold water, much more so in hot water; aqueous solution neutral.
2. Aqueous solution hydrolyses slowly on prolonged heating to sulphamate and bisulphate.
   $NH(SO_3K_2) + H_2O = NH_2SO_3K + KHSO_4$
   The hydrolysis goes rapidly in the presence of acids.
3. Combines readily with alkalis, CaO and NH_4OH giving tribasic salts of the type $NK(SO_3K)_2$, readily soluble in water, from which the IDS can be recovered by the action of weak acids such as CO_2 or SO_2.
4. Insoluble basic compounds of lead and barium are precipitated from the solution of IDS by the addition of basic lead acetate and ammoniacal $BaCl_2$ respectively.
5. Sodium nitrite and HCl converts IDS at once to sulphate, this allowing it to be quantitatively estimated as $BaSO_4$.
6. When ignited directly, or with H_2SO_4 as in the sulphate ash determination, the final product is K_2SO_4.
7. The relation between the electrical conductance due to IDS in white sugar solutions and the gravimetric ash from IDS is similar to that of normal sugar ash. The conductance method is thus still a reliable guide to the ash in white sugar even when there is heavy contamination with IDS.

Observations on the Distribution of IDS in the Sugar End of the Process during the Campaign

Once the simple technique for detecting IDS crystals by microscopic inspection had been developed it became an easy matter to trace their movement and concentration in the sugar end.

The crystals first become visible in the molasses alone and may remain thus indefinitely as the campaign proceeds. In this state they are voided in the discharged molasses and do no harm to the process. If, however, there is a progressive increase in the size and number of the crystals it is not long before they become trapped in the afterproduct sugar, and later, in the middle product sugar. From these points they are dissolved in the remelt and returned to the thick juice. Thus there is a sharp increase in the concentration of IDS in the sugar end as a result of the feedback process. Eventually the concentration becomes so high that crystallization starts in the white massecuites and so reaches the white sugar.

At these times the crystals can be seen by microscopic observation to be growing in the after and middle product massecuites in much the same way as the sugar does.

On one occasion a sample of molasses was found to be so rich in IDS that the salt settled out during the course of a few weeks and a yield of several grams was obtained from it.

Occurrences of IDS in White Sugar during the 1957/8 Campaign

Three short outbreaks in white sugar occurred at Allscott during the campaign. The first before the preventive action of returning A.P. sugar to the defecation had been arranged. The second was allowed to come by way of experiment to test what concentration of IDS could be tolerated in the sugar end, since according to the general opinion, it was undesirable to continue with the recirculation remedy unless it were really necessary. The third outbreak was a very short one, and was due to having waited too long before starting the recirculation: it seems to have been brought to a head by a particularly bad spinning A.P. strike. An examination of

BLAIRS

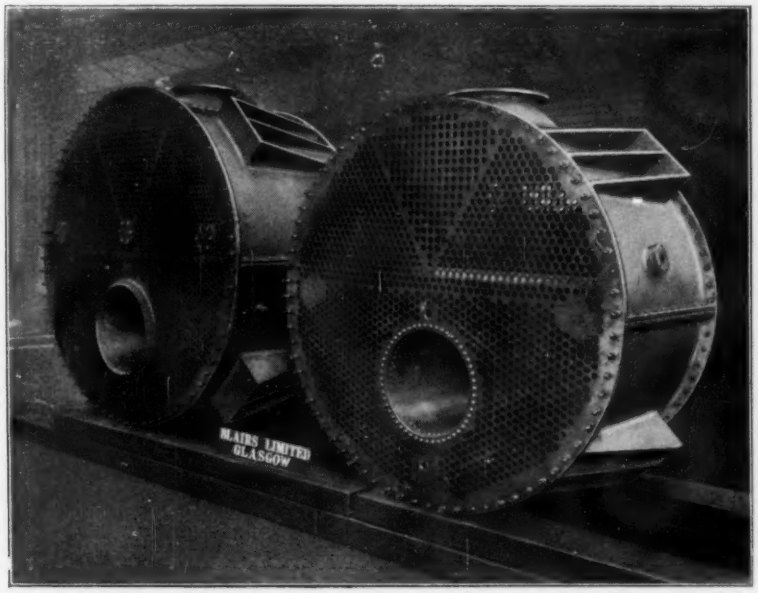
Sole Makers of
MULTIPLEX FILM EVAPORATORS

COMPLETE

SUGAR

FACTORIES & REFINERIES

DISTILLERIES, ABSOLUTE ALCOHOL & CHEMICAL PLANTS



The above illustration shows
Calandrias for Quadruple Effet Evaporator.

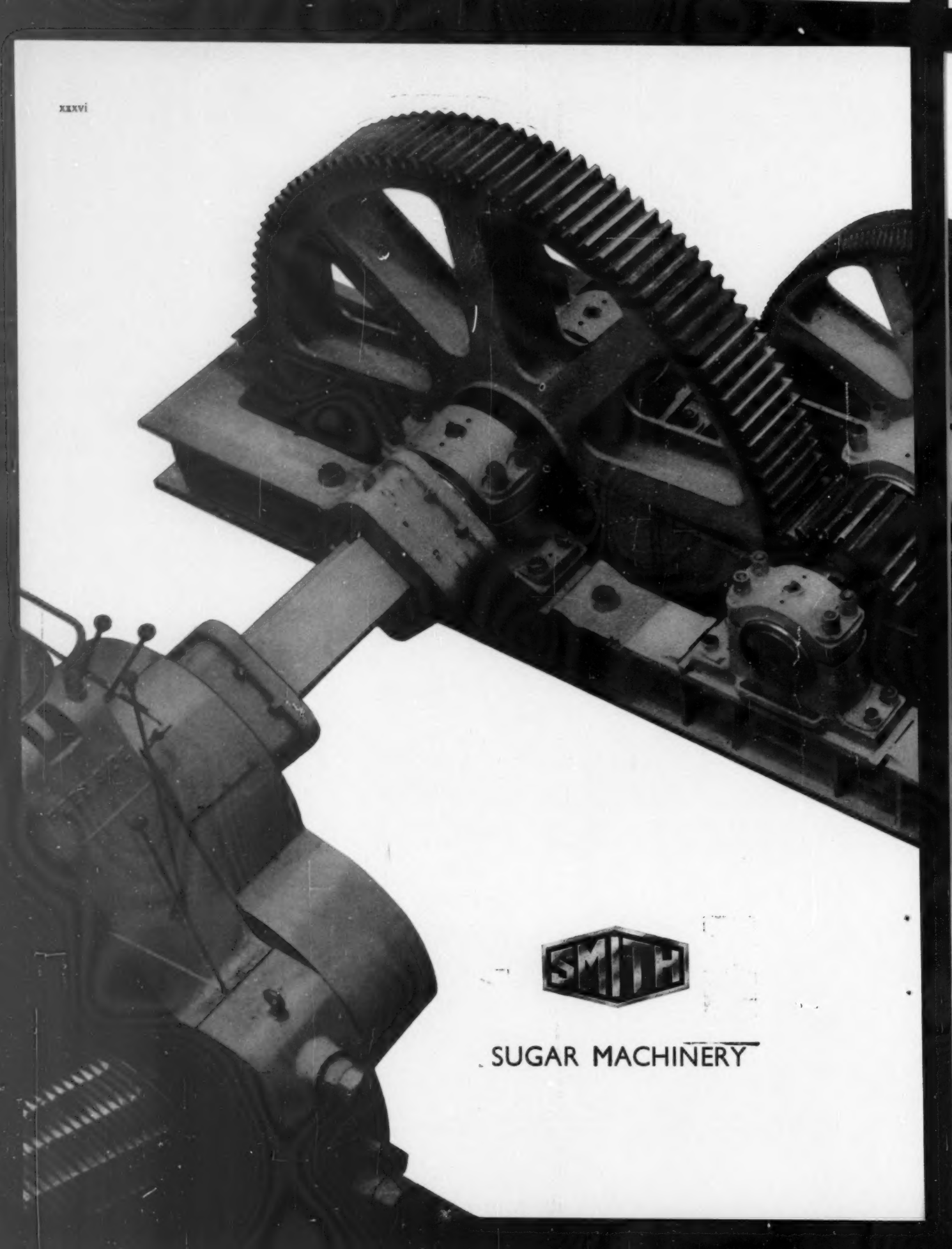
BLAIRS LIMITED

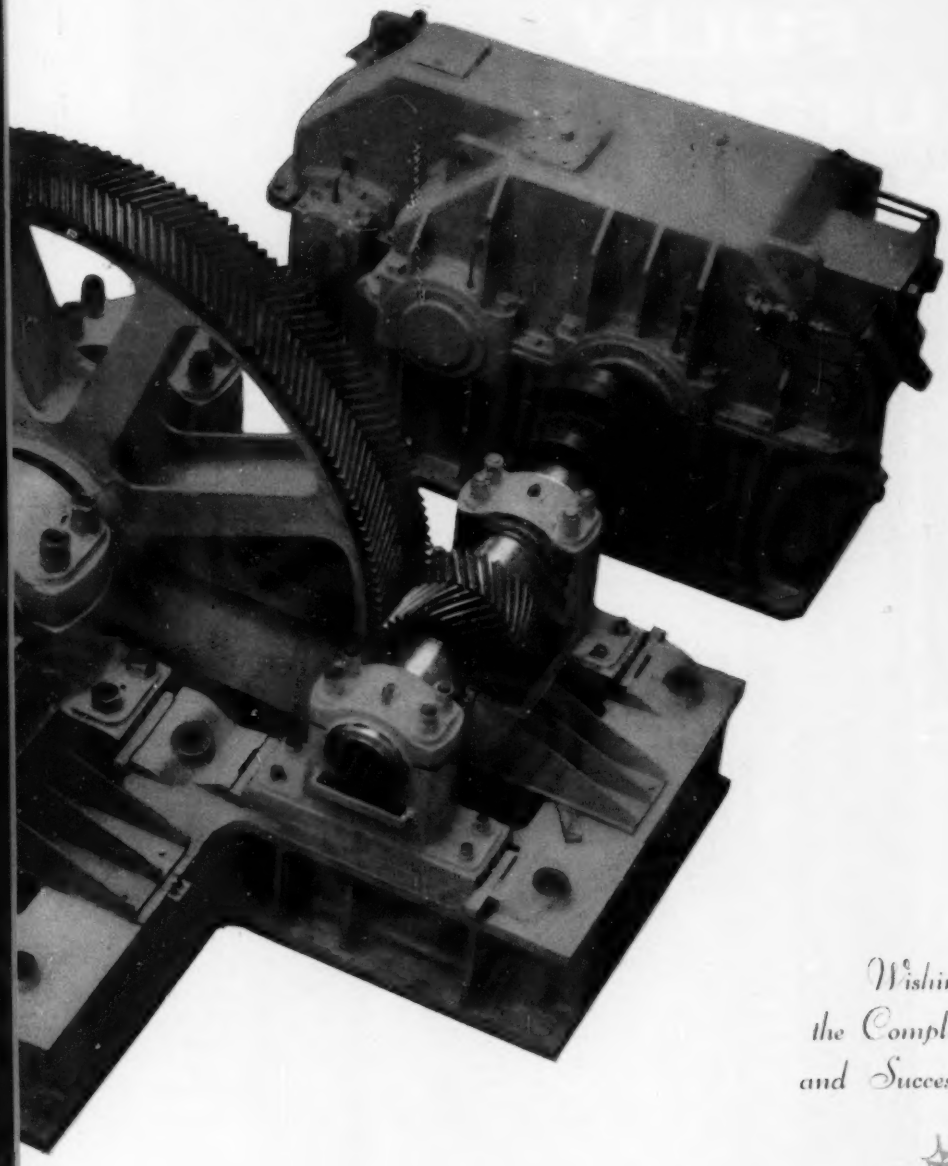
WOODVILLE STREET · GLASGOW, S.W.1

Cables: "BLAZON, GLASGOW"

London Office: **38 GROSVENOR GARDENS, S.W.1.**

Cables: "Multivap, Sowest, London"


SMITH
SUGAR MACHINERY



Wishing All Readers
the Compliments of the Season
and Success in the New Year

A. & W. SMITH & CO. LTD.

SUGAR FACTORY AND REFINERY ENGINEERS

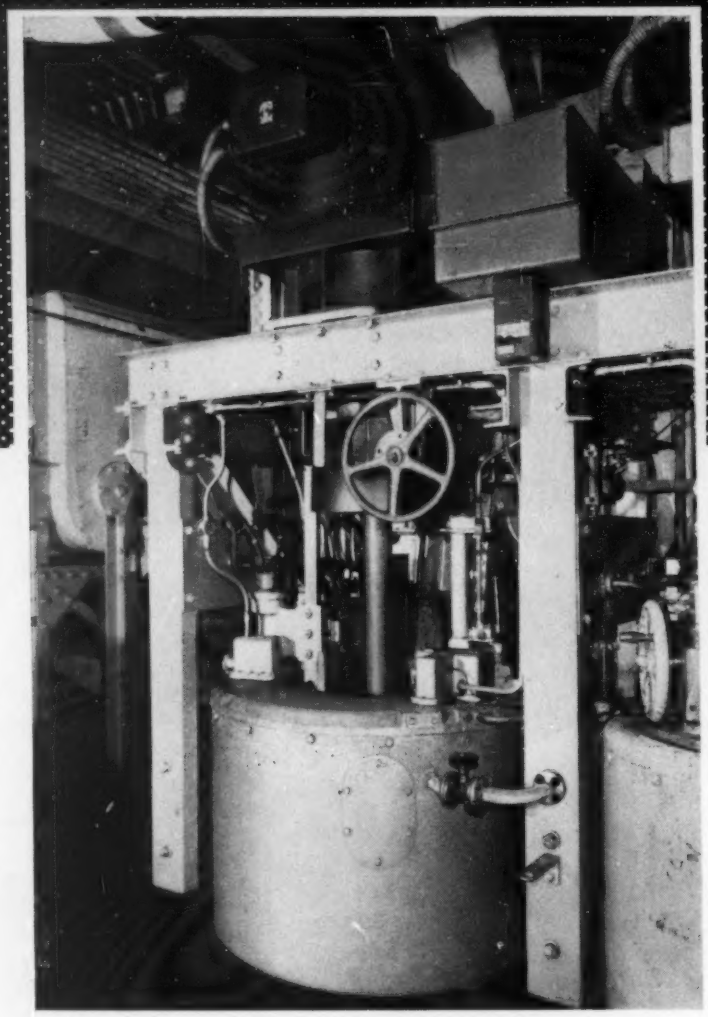
21 MINCING LANE · LONDON, E.C. 3

Cable Address : "Sugrengine London"

Works : COOK STREET, GLASGOW, C.5

COMPLETE SUGAR FACTORIES · EXTENSIONS · RENEWALS

FULLY AUTOMATIC CENTRIFUGALS



Our latest design of Fully automatic Centrifugal gives complete automation in centrifuging. There are no labour training problems; no allowance is necessary for human error. Each phase of the cycle can be preregulated for the type of sugar being cured.

POTT, CASSELS & WILLIAMSON LTD.

A Member of The Mirrlees Watson Group

Motherwell Lanarkshire Scotland

Cables: Pott, Motherwell

this A.P. sugar showed it to be densely packed with IDS crystals, and it is not unreasonable to suppose that this, acting like false sugar grain, actually caused the poor spinning quality.

During the last three weeks the IDS concentration in the sugar end became lower than it had been at any time during the campaign except the first week. There is reason to believe that this was due to increased formaldehyde addition to the battery.

Preventive Measures

Experiments during the off-season had shown that when sugar containing IDS is dissolved to about 12°Bx, limed, heated, carbonatated and filtered, little of the IDS remains in the filtrate. It seemed therefore that if the A.P. sugar—which had been observed to have a high IDS content—was returned to the raw juice, that there was a good chance that most of its IDS would be removed and so prevented from feeding back to the white pans.

This procedure was effectively put into operation whenever microscopic examination of the M.P. and A.P. sugars showed that the IDS concentration was approaching a dangerous level.

Although the outward appearance of things seemed to show without much doubt that the outbreaks of sulphonate ash were being prevented by this recirculation method, it seemed desirable to have some independent evidence that the IDS was actually being removed from the recirculated A.P. sugar. This confirmatory evidence was obtained by determining the IDS concentration in the raw juice (containing the A.P. sugar) as it entered the defecation and also in the filtered juice leaving the filter presses. It was found by the method of analysis given above that there was a reduction from 4 p.p.m. N equivalent to about 1 p.p.m. This confirmed the original laboratory experiments. We conclude therefore that the redefecation of the A.P. sugar removes much of the IDS from it but that its capacity to do so is limited; further that the capacity for removal was ample for the concentrations found during the last campaign.

The possibility of converting the IDS into the readily soluble sodium compound $NaN(SO_3K)_2$ by treating the massecuites with caustic soda was tested by adding about 50 lb of NaOH to a middle product pan that was known to be growing a good crop of IDS crystals. Microscopic observation of the IDS crystals after the addition of the soda however, showed that there was not the slightest tendency to go into solution: neither was there any appreciable increase in the pH. We conclude therefore that the buffer power of the syrup is far too high to permit a practical application of this principle.

It was observed also that the IDS crystals in A.P. crystallizers could be dissolved by adding lime ($Ca(OH)_2$), the soluble salt $Ca[N(SO_3K)_2]_2$ being formed. To add the quantity of lime necessary to effect this conversion is considered impractical.

Theory of the Origin of IDS in the Process

Of the known methods of forming IDS the one most likely to suit the process conditions is interaction between SO_2 and nitrites. Nitrites are known to exist in widely varying concentrations in the process juices between the diffusion and sulphitation stages. It seems feasible that the SO_2 in the sulphitation stage reacts with the nitrite in the juice forming nitrilotrisulphonate, which, owing to its instability at once breaks down to the imidodisulphonate (IDS).

It has already been pointed out that the reaction between sulphite and nitrite goes very slowly at neutrality but very rapidly under slightly acid conditions, and in view of this it seems not unlikely that the lower the pH in the sugar end the more complete would be the conversion of the nitrite to IDS: on the other hand the retaining of a sufficiently high pH would suspend the reaction until the reactants had passed out in the molasses.

Nitrites have been found in the diffusion juice, the 1st carbonatation, and the 2nd carbonatation juices in concentrations varying from less than 1 p.p.m. (as nitrite N) to over 20 p.p.m., though the beets and the diffusion supply water both have insignificant quantities.

It is fairly clear then that nitrites are generated in the diffusion process and then passed forward without much change till they meet the SO_2, at which stage, if the pH is favourable, they are converted to IDS. Carruthers *et al.* have suggested[1] and since confirmed[2] that the nitrate in the beets could be reduced to nitrite during diffusion by the organism *B. stearothermophilus*.

The theory of the bacterial origin of the nitrite has now been strongly supported by practical experience at the Allscott factory through the liberal dosing of the diffusion system with formaldehyde. As a result of this experience it now seems fairly well established that the nitrite content of the juice can be kept at a level not exceeding 1 p.p.m. by adequate treatment of the diffusion with formaldehyde, and under these conditions no IDS has been detected at any part of the process.

The nitrite test has now become a routine test at the Allscott factory, and the dosing of the diffusion system with formaldehyde is so regulated to keep the nitrite level of 2nd carbonatation filtrate at about 1 p.p.m. (N equivalent). It must be mentioned in passing that the nitrite level is used not only in connexion with IDS formation, but also as a guide to the bacterial cleanliness of the diffusion.

Although the main part of the nitrite is to be found in the diffusion juice, it is often noticed that the concentration in the second carbonatation juice is a little higher. This suggests that there are additional minor sources of formation after the diffusion. Another possibility is that the process of nitrite formation in the diffusion is not quite completed

[1] *I.S.J.*, 1958, **60**, 113.
[2] *I.S.J.*, 1958, **60**, 335.

when the juice leaves the diffusion: perhaps there is an intermediate nitrogen compound whose conversion to nitrite goes on to a small extent after diffusion.

One additional active source of nitrite generation was found at the Allscott factory in a layer of stagnant foam lying on the surface of the diffusion juice in the measuring tank. It is not known to what extent this contributed to the whole nitrite content.

When investigating the distribution of nitrite concentration in the carbonatation juices, the curious fact was noted that the apparent nitrite concentration increased during the second carbonatation, the increase being praticularly noticeable between the inlet and the outlet of the pump taking the 2nd carbonatated juice away to the filters. It was this observation which strengthened the idea, just mentioned, of an intermediate N compound: one which could take up oxygen from the saturation gas through the vigorous agitation and become nitrite.

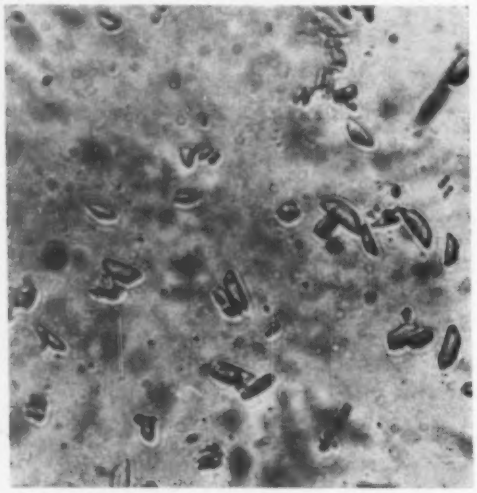


Fig. 2. IDS in crystallizer sugar—"heavy" 22nd January 1959. (×500)

A compound that suggested itself in this connexion is the calcuim salt of hyponitrous acid, $H_2N_2O_2$. According to the recorded properties of hyponitrites the calcium salt could be expected to remain stable long enough to reach the second carbonatation, and further to yield a certain amount of nitrite on oxidation. After some trouble a small amount of the hyponitrite was prepared and aerated in a sugar solution, the solution afterwards being tested for nitrite. It was concluded from the experiment that there was no nitrite formation—or at the most only a trace.

Method of Determining IDS

The following method has been used for determining the concentration of IDS in juices: the method is fairly simple but its accuracy has not been tested. About 500 ml of juice (about 12°Bx) is treated with an excess of $BaCl_2$ + ammonia. The mixture is heated till the precipitate coagulates and is then filtered. The precipitate contains the basic barium salt of IDS together with the sulphate and sulphite of barium.

Fig. 2a. Enlarged part of Fig. 2. (×1000)

Fig. 3. IDS in raw sugar—"heavy." February 3rd, 1959. (×800)

After washing, the precipitate is digested in dilute acetic acid to dissolve the IDS salt and again filtered, washed with hot water and the filtrate quantitatively collected.

The IDS is reprecipitated from the filtrate with ammonia and $BaCl_2$, filtered and washed, and transferred to a beaker, boiled with HCl to remove SO_2 and finally treated with sodium nitrite and a

little $BaCl_2$ to convert the sulphonate to $BaSO_4$. The latter is determined in the usual manner.

Nitrite test

A sample of second carbonatation filtrate is cooled and acidified with a small quantity of 50% H_2SO_4. The sample is then divided into two parts and to one of them are added a few spots of a dilute aqueous solution of meta-phenylene diamine. The orange colour which develops if nitrite is present takes about ½ hour to complete. The colour is then roughly estimated by eye, or if required on a photoelectric absorptiometer using the acidified blank as a standard for comparison: a calibration graph is made using $NaNO_2$.

Fig. 4. IDS in white massecuite, showing crystal forms 7 and 8. 4th February 1959. (×800)

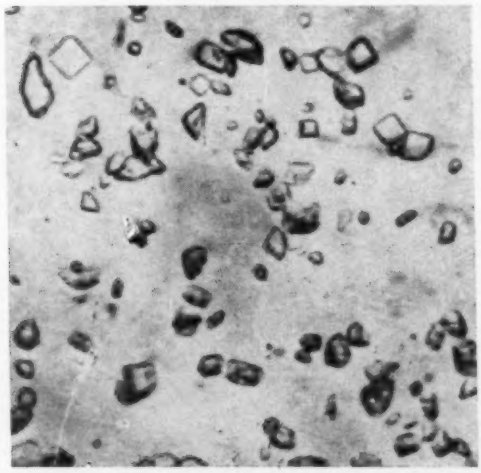


Fig. 5. Allscroft residual campaign, 1957/58. IDS "very heavy." (×500)

The method is not sensitive or suitable for low nitrite concentrations in the region of 1 p.p.m. N: for such concentrations the method of BUCKETT, DUFFIELD and MILTON[8] is used; this method uses sulphanilamide and N(1-naphthyl)-ethylenediamine-dihydrochloride and is much more sensitive than the *meta*-phenylene diamine method.

For diffusion juice it is necessary to remove the albumen, especially if the N concentration is low. To do this the juice is warmed with a little pure milk-of-lime, the quantity added being just sufficient to cause flocculation and permit filtration.

THE OCCURRENCE OF IDS AT FELSTED FACTORY DURING THE 1958/59 CAMPAIGN

Although a close daily check on the crystallizer sugar was made no IDS crystals were detected before 14th January 1959, but from this date until the end of the campaign on 9th February 1959 IDS in crystallizer sugar was always present in concentrations considered medium to very heavy. On sixteen days of this 27-day period tests were positive on Raw Sugar, the concentration varying from "Trace" or "Very Light" to "Medium/Heavy," On two days only was IDS seen in the white massecuite and on no occasion in the white sugar.

Since the occurrence was confined to Raw and Crystallizer sugars no reliable chemical tests could be made.

All the forms shown in Fig. 1 were seen by L. G. GRIMMER, Works Chemist at Felsted, at the onset and for three or four days shape No. 6 only was seen. For some days the shape was then similar to shapes 1-4 and was no doubt due to excessive washing. At one period the IDS crystals on the plate were almost entirely triangular which eventually changed to v-shaped. The photographs shown below (Figs. 2–4) illustrate the various forms. It is regrettable however that, owing to a mishap with the sample and negatives, forms No. 6(a) and (b) are not shown. On the two occasions when crystals were found in white massecuite they were both of the pipette (7) and ragged shapes (8).

For comparison a print of Allscott Residual Sugar (1957/58 campaign) is shown (Fig. 5). This was reported to be "rich" and on the "Heavy" days at Felsted the amount would appear to be about two-thirds of Allscott Residual. It was not found necessary to return any sugar for defecation. It is interesting to note that the average ash in white sugar during the occurrence was 0·014% and this was identical with a corresponding period up to 14th January 1959. The highest ash found on any day was 0·019%.

ACKNOWLEDGMENTS

The author wishes to express his thanks to the Directors of British Sugar Corporation Ltd., for permission to publish this work, and to all those who assisted in the investigation.

[8] *Analyst*, 1955, **80**, 141.

A ROUTINE TITRIMETRIC METHOD FOR THE DETERMINATION OF INVERT SUGARS IN REFINED WHITE SUGARS

Using Ethylene Diamine Tetra-Acetic Acid

By JUNE KNIGHT and C. H. ALLEN
(Tate & Lyle Ltd., Plaistow Wharf Refinery, London E.16.)

SUMMARY

A SIMPLE titration method using alkaline cupric sulphate and ethylene diamine tetra-acetic acid for the determination of invert sugar in refined white sugar is described. It gives results comparable to those obtained by the Methylene Blue and Triphenyl Tetrazolium Chloride methods.

INTRODUCTION

For the determination of invert sugar in refined white sugar the standard procedure used in T. & L. laboratories has for many years been the Methylene Blue method of DE WHALLEY[1]. The main advantage of the Methylene Blue method is its extreme simplicity. Very little apparatus is needed and accurate results are obtainable, but rigid adherence to procedural detail is essential. Its disadvantage is that its effective range is limited to 0·004–0·010% since the colour differences outside this range are too small to allow for precise estimation. Invert contents higher than 0·01% can, however, be estimated by dilution of the sugar with known amounts of pure sucrose and further testing.

The method of CARRUTHERS and WOOTTON[2] using triphenyl tetrazolium chloride has a greater range, but here again the method must be strictly standardised, particularly with regard to time of heating and thickness of test tube.

The method here described has been developed from that devised by H. V. STREET[3]. It is a simple titration procedure using ethylene diamine tetra-acetic acid, has a range adequate for refined white sugars and is much less sensitive to time/temperature variations than are the T.T.C. and M.B. methods. The EDTA method is now preferred in the T. & L. Laboratories.

REAGENTS

Ethylene Diamine Tetra-Acetic Acid Solution. (*Di-sodium Salt.*)
0·005N solution

Murexide Indicator. (Screened with methylene blue).
0·5 grams murexide
0·15 grams methylene blue
40·00 grams sodium chloride
ground together to give a mixed solid.

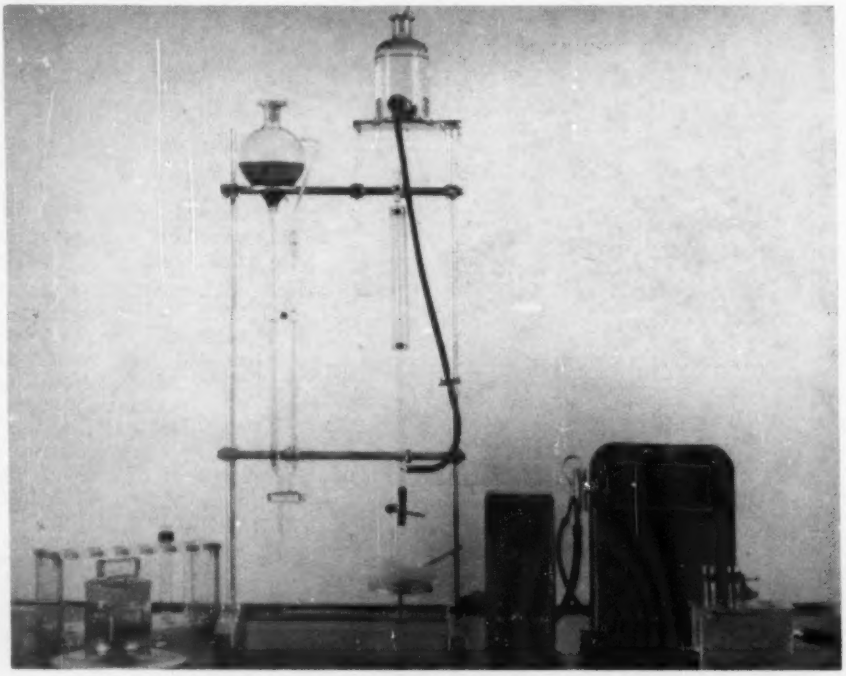


Fig. 1

[1] *I.S.J.*, 1937, **39**, 300.
[2] *I.S.J.*, 1955, **57**, 193.
[3] *Analyst*, 1958, **83**, 628.

Continuous BMA Sugar Centrifugals
for Affination and Massecuite Treatment

Its advantages are:

- No maintenance of pneumatic or electric controls
- High centrifugal efficiency
- Electric power peaks eliminated
- No foundations
- 1 operator for each station
- Minimum of spare parts
- Uniform quality and quantity of the sugar
- Three-stage curing

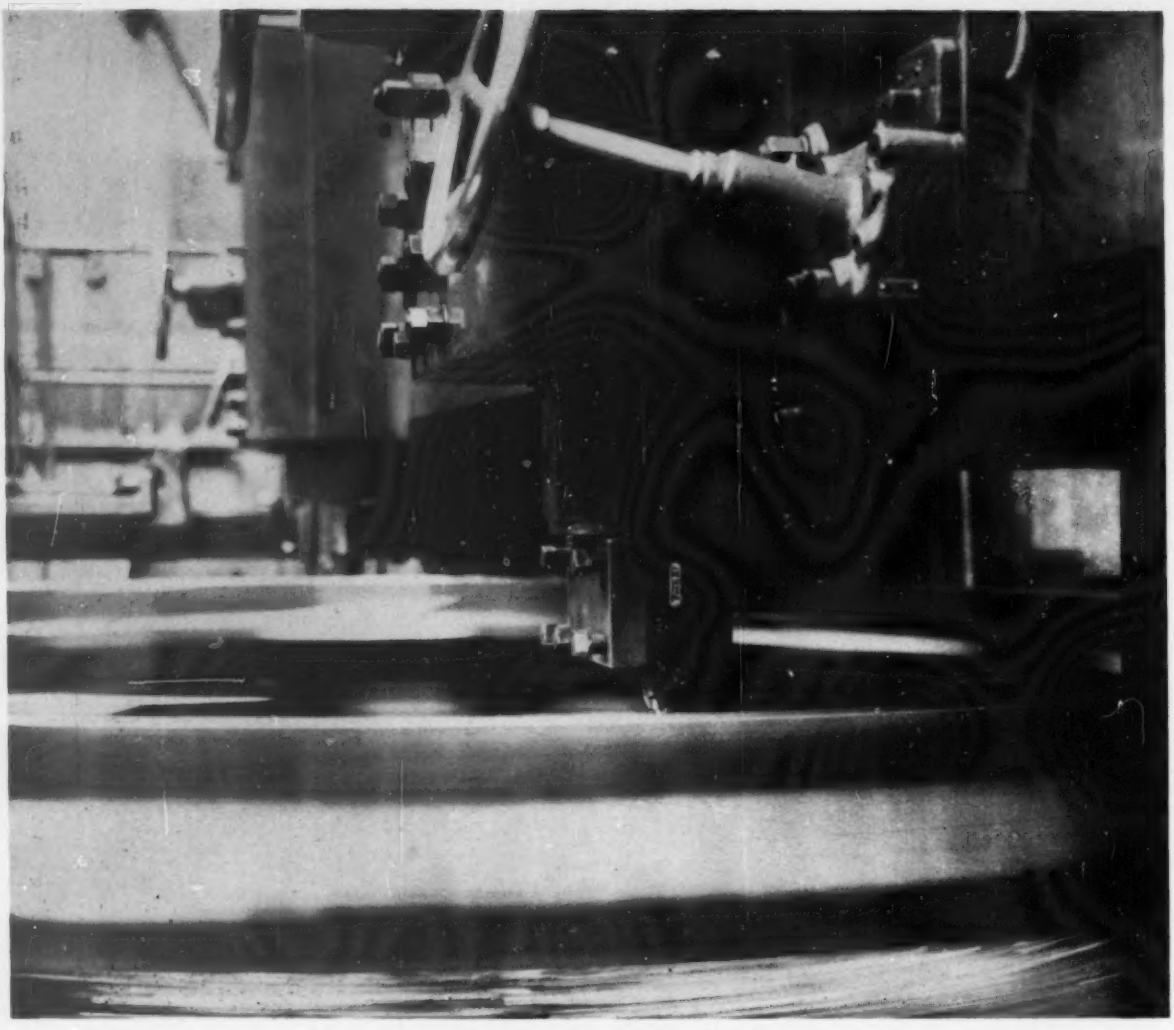
To date 200 continuous BMA-centrifugals are on order or have been supplied.

BMA

BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT

BRAUNSCHWEIG · WESTERN GERMANY

MORE THAN FOR YEARS OF COMPLETE FACTORIES FOR: BEET SUGAR AND CANE SUGAR AS WELL AS PLANTS FOR ALCOHOL, YEAST, STARCH, TANNING AND EDIBLE OILS.



turning out

the big stuff is nothing new for Crofts. They've been doing it for years. Really big stuff, too. Spur and helical gears up to 185″ diameter, 37″ face width, 5″ CP—that's the way Crofts talk.

Here's a spur in Crofts fitting shop being turned into a powerful help to somebody, and it could be you. When it comes to big stuff (casting, machining and cutting), call Crofts—they've been doing it for years.

★ *Customer's blanks can be cut and gears manufactured to special order, but remember Crofts STOCK RANGE includes Spur and Mitre Gear Drives up to 70 hp and Bevel Gears up to 44 hp. We also produce Internal Gears, Racks and Pinions, Worms and Wheels, Spiral Bevels and Spiral Mitres. And Crofts can handle Steel Castings up to 8 tons! Publication 159 tells the whole story—your copy's waiting.*

For EX-STOCK service in BIRMINGHAM ring ASTon Cross 4471/2

Crofts

CROFTS (ENGINEERS) LIMITED

POWER TRANSMISSION ENGINEERS

THORNBURY, BRADFORD 3, YORKSHIRE. Telephone: 65251 (20 lines) Telegrams: "Crofters Bradford Telex" Telex 51186

WORLD WIDE REPRESENTATION

Alkaline Copper Solution.

40 ml of 1·0 N sodium hydroxide solution is added to approximately 600 ml distilled water. To this solution 25 grams of sodium carbonate and 25 grams of potassium sodium tartrate are added and the whole shaken to dissolve.

6.000 grams of cupric sulphate ($CuSO_4$, $5H_2O$) are dissolved in approximately 100 ml distilled water and added to the alkaline tartrate solution then being made up to 1 litre with distilled water.

The murexide indicator solution was originally prepared by adding 0·25 gram of the dyestuff to 50 ml water. The solution was thoroughly shaken, the solid allowed to settle and the supernatant liquid used for the test. It was later found that the inclusion of methylene blue as a screening agent resulted in a sharper end-point, the colour change ranging from green through grey to the final purple colour.

Unfortunately both the screened and unscreened indicators were found to be unstable, lasting for a day or two only. Further experiments however showed that a solid indicator based on sodium chloride as a diluent is stable.

The solid indicator is now prepared by grinding together 40 grams analytical reagent-grade NaCl, 0·15 gram methylene blue and 0·5 gram murexide. Humid atmospheric conditions tend to moisten the indicator, causing caking so that the free-flowing character of the material is lost. The indicator is best stored in a desiccator. A suitable desiccant vessel is a wide mouthed glass bottle with a ground stopper containing a small silica gel balance desiccator over which a small open-top tube of the indicator can be stored when not in use and is quickly available when wanted. Approximately 0·10 gram of indicator is used for each test, this quantity being scooped out of the tube in the desiccant bottle by means of a suitable size glass rod which has a flattened end bent at right angles.

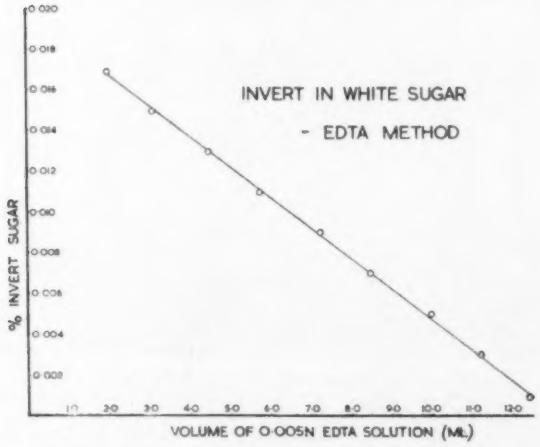


Fig. 2

PROCEDURE

5 grams of sugar are dissolved in 5 ml cool distilled water in a 6 × ¾ in test tube. Exactly 2·00 ml of the alkaline copper solution is added and mixed by shaking. The test tube is then immersed in a boiling water bath for five minutes, then cooled immediately in a cold water bath.

The cooled solution (and test tube washings) are transferred to a titrating dish. Approximately 0·10 gram of the screened murexide indicator is added and the solution is titrated with 0·005 N EDTA solution. (See Figure 1.)

Results of Comparative Tests Carried out at Plaistow Refinery

Comparison of the EDTA Method against the Standard Methylene Blue (de Whalley) Method

Sample	% Invert *EDTA*	% Invert *Methylene Blue*
1	0·003	0·003
2	0·004	0·005
3	0·004	0·004
4	0·004	0·003
5	0·007	0·007
6	0·008	0·009
7	0·009	0·009
8	0·015	0·020*

* Estimated after dilution with pure sucrose.

Results of Comparative Tests (in Triplicate) using EDTA, T.T.C. and M.B. over Normal Range of % Invert Sugar in Refined Sugars

Sample	% Invert *Method* *EDTA*	*T.T.C.*	*M.B.*
A	0·003	0·002	0·0035
	0·003	0·002	0·003
	0·003	0·002	0·003
B	0·005	0·004	0·0045
	0·005	0·003	0·005
	0·005	0·0035	0·005
C	0·0045	0·004	0·0065
	0·0045	0·004	0·005
	0·0045	0·004	0·005
D	0·006	0·009	0·0065
	0·006	0·008	0·0065
	0·006	0·008	0·0065
E	0·007	0·008	0·008
	0·007	0·008	0·007
	0·007	0·008	0·007
F	0·010	0·012	0·011
	0·010	0·013	0·011
	0·010	0·013	0·011

Estimation of % Invert Sugar when Diluting Sugars of High Invert Content with Pure Sucrose

Sample	*EDTA* *Undiluted*	*EDTA* *Diluted*	*Method* *T.T.C.*	*M.B.* *Diluted*
G	0·019	0·019	0·021	0·025
H	0·019	0·020	0·023	0·025
I	0·020	0·021	0·022	0·023

Just before the titration end-point is reached, the colour changes from green to the purple end-point. The purple colour disappears slowly, due to oxidation, at a rate depending to some extent on the amount of cuprous oxide present, and the titration at the end-point should, therefore, not be too prolonged.

A graph has been constructed from the titres obtained where known quantities of invert sugar are added to pure sucrose and tested by the procedure given above. (Fig. 2.) The relationship between titres and % invert is linear, over the range 0·001 to 0·017% invert.

The authors wish to thank the Directors of Tate & Lyle Ltd. for permission to publish this paper.

THE PRESSURE REQUIRED TO FEED CANE MILLS

By C. R. MURRY, B.E., A.M.I.E.(Aust.)

(Sugar Research Institute Fellow, Dept. of Mechanical Engineering, University of Queensland)

Part I—Theoretical Considerations

1. Introduction

EXPERIMENTAL and theoretical investigations of mill feeding have been carried out in the Department of Mechanical Engineering of the University of Queensland. The earlier results of these investigations have been reported by Bullock[1,2,3]. These results suggested a theoretical treatment which allows the required feed pressure to be calculated for any particular conditions. This treatment was shown to agree with experimental trends[3] but contained some errors leading to unsatisfactory agreement between the levels of experimental and theoretical results. Further investigations have led to good agreement and it is the purpose of this paper to set out the theoretical considerations as now understood and to show the agreement between the results of the theoretical treatment and experimental results.

The view has often been expressed (e.g., by Crawford[4]) that a mill has a characteristic "angle of grip" which changes as the milling conditions change. The investigations reported here show that this simplified theory is insufficient and that the angle of grip can be predicted from the known physical properties of prepared sugar cane without resort to empirical findings.

The capacity or maximum crushing rate of a mill must be largely determined by the "grip" of the rolls on the cane blanket. This is, of course, a friction effect. However, prepared cane is not a solid material and the "compressibility" of the cane will influence the maximum rate at which the mill will crush. In addition, in all practical feeding arrangements, some feeding force is applied to the cane. This factor must also be taken into consideration.

The theoretical treatment set out here takes account of the effects of these three factors (namely, friction, compressibility and feed force) on the maximum crushing rate of a mill. The equations are developed for two rolls but experiments carried out by the Sugar Research Institute (Mackay, Queensland) have shown[5] that for reasonably small mill ratios (less than about 2:1) the maximum crushing rate of a three-roll mill is the same as that of a two-roll mill with similar feeding geometry. Therefore, this theory may be applied with some confidence to a three roll mill providing the feed-side conditions are used.

2. The Capacity of the Mill*

If a mill is feeding without slip between the rolls and the cane mat, the velocity of the mat is given by the "horizontal" component of the roll surface speed at the point of contact (Figure 1). That is, cane entry speed S_H is given by

$$S_H = S \cos \alpha \qquad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where S = surface speed of rolls

and α = angle at which cane mat contacts the rolls.

If q_c = mass rate of cane per unit length of roll,

h_a = height of cane at entry,

and d_a = density of cane at entry,

then $q_c = d_a h_a S \cos \alpha$

[1] "Self-feeding characteristics of an experimental sugar mill." *Proc. 9th Congr. I.S.S.C.T.*, 1956; *I.S.J.*, 1957, **59**, 48.

[2] "An investigation into the crushing and physical properties of sugar cane and bagasse." *Ph.D. Thesis* (University of Queensland), 1957.

[3] *Sugar J.* (La.), 1958, **21**, (5), 11–17; (6), 26–29; (7), 13–20; *I.S.J.*, 1959, **61**, 208.

[4] *Proc. 22nd Conf. Queensland Soc. Sugar Cane Tech.*, 1955, 167; *I.S.J.*, 1956, **58**, 198.

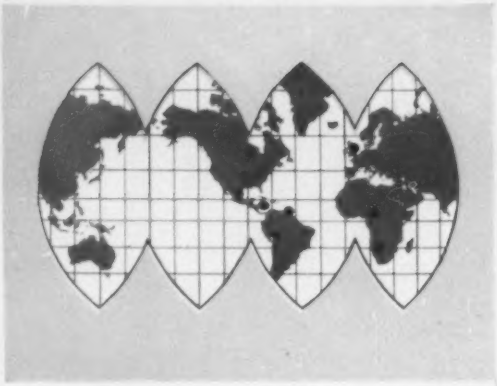
[5] *Tech. Report*, 1958, (50); *I.S.J.*, 1959, **61**, 367.

* The mill geometry was studied by the author under Bullock and Equation 2 is reported in the author's undergraduate thesis (University of Queensland, 1956). The next equation for q_c which follows immediately has also been reported by the Sugar Research Institute (*Tech. Rpt.*, 1957, (37); *I.S.J.*, 1958, **60**, 170).

W. NURNBERG

Another newcomer is instructed in the Stewart tradition

DUNCAN STEWART & COMPANY LIMITED, Park Gate, Glasgow



Refineries the world-over find FAS-FLO* FILTERS more profitable!

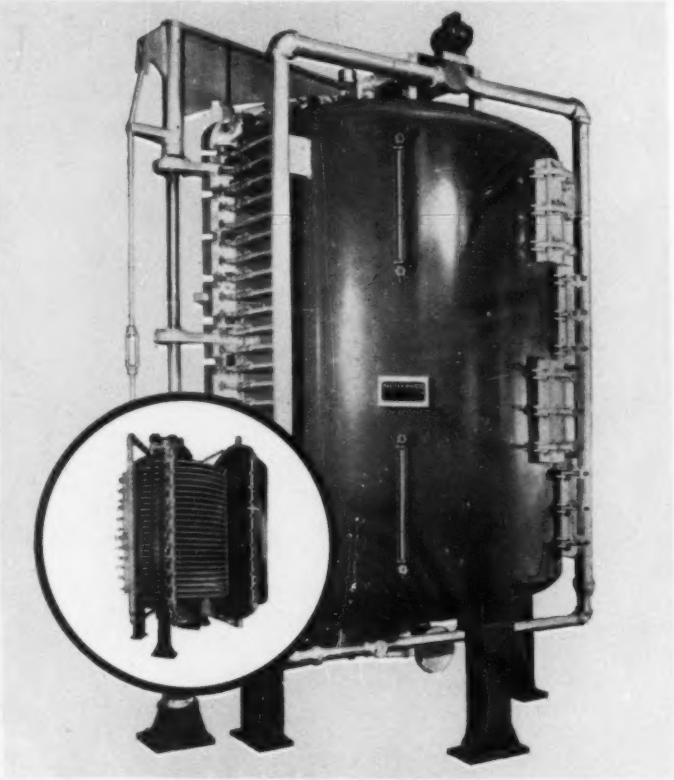
Throughout sugar-producing areas, refineries report increased production, higher recovery, ease of operation and maintenance and a minimum of down-time with unique FAS-FLO FILTERS.

These important advantages of our horizontal-leaf design tell you why:

- **uniform thickness of filter cake means faster, more complete sweetening off!**
- **no interruptions due to cake falling off!**
- **no "blinding" of filter cloths!**
- **time-saving 7-minute sluicing cycle with high-pressure jets!**
- **filter remains closed during sluicing!**
- **separate outlet, shut-off cock and sight glass for each leaf!**
- **filter cloths last four to six months — require no sewing!**
- **most easily automated filter made!**

We will gladly discuss the added profit potential you might realize with FAS-FLO FILTERS.

*Reg. TM of FAS-FLO FILTER CORPORATION, New York



552 sq. ft. split shell model. This model can be made in any size desired. Inset is rear view with door open showing horizontal leaves.

Most efficient carbon you can use!

Suchar

ACTIVATED CARBON

Developed specifically to meet the decolorizing and filtration needs of the cane sugar industry, SUCHAR Activated Carbon has amazing surface area and porosity.

There's no better way to remove unwanted taste, odor and color bodies from sugar liquors than filtration with economical SUCHAR Activated Carbon.

Let us quote on your requirements.

SUCHAR SALES CORPORATION

CONSULTING ENGINEERS

76 Beaver Street
New York 5, N. Y.

Cable Address: "SUCHARING" N.Y.

SUCHAR
FOR CANE

EXCLUSIVE DISTRIBUTORS OF SUCHAR ACTIVATED CARBON FOR THE CANE SUGAR INDUSTRY AND FAS-FLO FILTERS

From the geometry

$$h_a = D\left\{1 + \frac{W_o}{D} - \cos\alpha\right\} \quad \ldots\ldots\ldots(2)$$

where D = roll diameter

and W_o = work opening between rolls.

Hence $q_c = d_a SD\left\{1 + \frac{W_o}{D} - \cos\alpha\right\}\cos\alpha$

BULLOCK[3] has defined a *capacity number* by

$$C_N = \frac{q_c}{d_a SD} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

and hence the equation governing mill feeding from considerations of the geometry of the mill is

$$C_N = \left(1 + \frac{W_o}{D} - \cos\alpha\right)\cos\alpha \quad \ldots\ldots\ldots (4)$$

C_N has a maximum at $\alpha = \cos^{-1}\frac{1}{2}\left(1 + \frac{W_o}{D}\right)$

and this maximum is $\frac{1}{4}\left(1 + \frac{W_o}{D}\right)^2$. Since $\frac{W_o}{D}$ is small for normal mill settings the maximum value of C_N is not much greater than 0·25.

C_N may be thought of as a dimensionless crushing rate per unit speed. Equation 4 shows that, for a constant work opening, C_N is a function of α and from this point of view C_N is a measure of the "grip" of the rolls on the cane. The importance of this number will become evident as the paper proceeds.

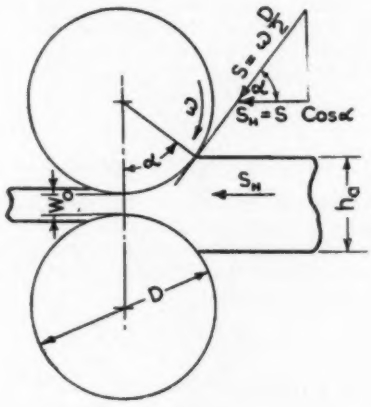


Fig. 1

3. THE DIFFERENTIAL EQUATION FOR FORCES IN THE MILL†

Consider the element of cane subtended by angle $d\theta$ and shown in the enlarged view in Figure 2. The radial forces F_r are due to the pressure of the material on the roll surface. The tangential forces F_t are due to the friction drag of the roll surfaces on the cane element. The forces F and $F + dF$ are the forces exerted by the element of cane on the immediately adjacent elements. These forces are compressive forces because of the tendency of the material to expand laterally. The total horizontal force exerted by the element on its surroundings is

$$2(-F_r \sin\theta + F_t \cos\theta) + dF$$

Put $dF = \frac{dF d\theta}{d\theta}$ and $F_t = \mu F_r$ where μ is the ratio of the tangential force to radial force and has a maximum value equal to the coefficient of friction between the cane and the roll surface. Let p (a function of θ) be the normal load per unit area exerted by the cane on the roll. Then, for unit length of roll,

$$F_r = p\frac{D}{2}d\theta$$

and the total horizontal force exerted by the element becomes

$$\left\{\frac{dF}{d\theta} - pD\cos\theta(\tan\theta - \mu)\right\} d\theta$$

The force required to accelerate the mass of the element is small and may be neglected and, therefore, the expression above may be equated to zero, giving:

$$\frac{dF}{d\theta} = pD\cos\theta(\tan\theta - \mu) \quad \ldots\ldots\ldots\ldots (5)$$

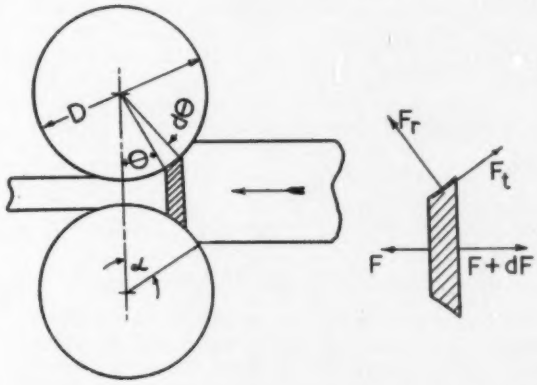


Fig. 2

4. INTERPRETATION IN TERMS OF MILL FEEDING

From equation 5 we see that the horizontal force F has a minimum at $\tan\theta = \mu$ and this minimum is zero. At all values of θ less than $\tan^{-1}\mu$ the frictional forces will be sufficient to feed each element of cane without horizontal forces between the elements.

† A similar differential equation was given by the Sugar Research Institute (*Tech. Rpt.*, 1957, (41); *I.S.J.*, 1958, **60**, 171) and both that development and the one given here follow those of Orowan for steel rolling. (*Proc. Institution Mech. Eng.*, 1943, **150**, 140.)

The value of θ given by $\beta = \tan^{-1}\mu$ is the angle at which the mill would feed without external feeding forces of any kind as in the simple theory. Experimental results for the coefficient of friction and for the feeding of cane mills (both factory and experimental) show that this angle is often exceeded (that is, α is greater than β). This is because of the small feed forces applied to the cane mat.

The total horizontal force required to feed the mill under these conditions is given by integrating equation 5 between the limits β and α. That is, the feed force, F_F, is given by

$$F_F = D\int_{\beta}^{\alpha} p \cos\theta\,(\tan\theta - \mu)\,d\theta \quad \ldots\ldots\ldots\ldots (6)$$

To perform this integration we need to know the coefficient of friction (μ) and the pressure (p) as functions of θ. These properties of the cane have been investigated and the results as they affect this theory are discussed below.

5. The Coefficient of Friction

Extensive investigations of this property have been previously reported[6]. From these investigations it is deduced that over the small range in pressures encountered in the region β to α the coefficient of friction may be considered to be independent of pressure. The coefficient of friction on a grooved surface is not influenced by the fineness of preparation at these low pressures, but it does depend on the rubbing speed. This may be taken as the surface speed of the rolls. The value of μ found for the rolls of the experimental two-roll mill installed in the University of Queensland are given in Table 1.

Table 1

Surface Speed (ft per min.)	10	30	50	70
Coefficient of Friction	0·40	0·36	0·32	0·28

6. Pressure—Volume Relationships

An extensive investigation of the pressure-volume relationships at low pressures, the results of which have not been previously reported, has been carried out. The results have been analysed with pressure as a function of *compression ratio*, C, which is defined by $C = \dfrac{\text{no-void volume of original cane}}{\text{volume occupied by cane or bagasse}}$

The no-void volume is calculated from the fibre fraction of the cane by weight, the density of the juice and the density of the cane fibre. It has been shown (Bullock[3]) that the no-void density of cane is almost constant over a fairly wide range of fibre fractions and juice densities and a figure of 71 lb per cu.ft. may be used.

Experiments have been carried out using a hydraulic press. The volume of a weighed sample of cane was reduced rapidly in discrete steps and the maximum pressures required to produce the volume reductions were read. In general, for pressures below 200 lb per sq. in. and compression ratios less than 1·5 (which covers the region α to β) the results conform to the equation $p_v = A(C - B)^2$, where p_v is the required pressure, C the compression ratio, and A and B are constants depending on the experimental conditions. While A and B depend to some extent on the weight of sample used they depend mainly on the fineness of preparation of the cane. It may also be shown that A is a function of B only, to a fair degree of approximation. The constant B is the compression ratio which the cane takes up at zero pressure.

It has been previously shown[7, 8] that the bulk density of cane at a small arbitrary test pressure is a measure of the fineness of preparation of cane. Since B is the ratio of the no-void volume of cane to the volume actually occupied at zero pressure, it may be shown that B is proportional to the bulk density at zero pressure and, therefore, is a measure of the fineness of preparation.

Table 2

Preparation	*Fine*	*Medium*	*Coarse*
A (lb per sq.in.)	85·7	133	162
B	0·580	0·558	0·482
Bulk Density at 7½ lb per sq.in. (lb per cu. ft.)	62·2	56·5	49·5
d_a (lb per cu.ft.)	41·2	39·6	34·2

Table 2 sets out the values of A and B for three different degrees of preparation. If these results are compared with those reported by Bullock[3] it will be found that this new work gives pressures considerably lower than those found in the earlier work.

7. Modification of Equation 6

To correlate equation 6 with the results of section 6 we require the relationship between p and p_v which is the vertical load per unit area in an element. If we consider the *forces* on the element of roll surface, then resolving vertically:

$$F_r \cos\theta + F_t \sin\theta = p_v \frac{D}{2}\cos\theta\, d\theta$$

since the area for p_v is horizontal. Hence

$$p_v \frac{D}{2}\cos\theta\, d\theta = p\frac{D}{2}d\theta\cos\theta + \mu p \frac{D}{2}d\theta\sin\theta$$

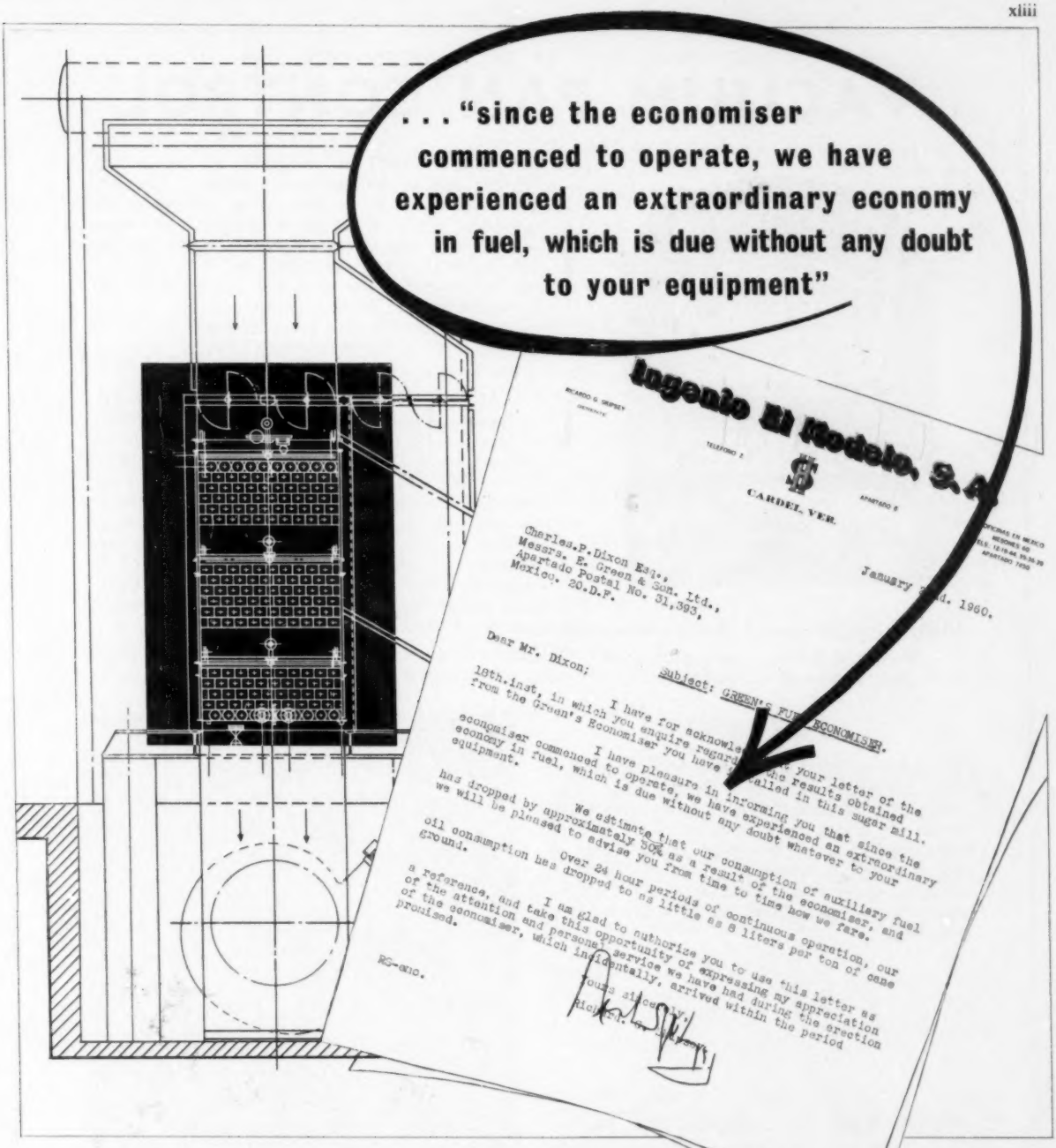
and, thus, $p_v = p(1 + \mu\tan\theta)$

Substituting in equation 6 we have

[6] Bullock & Murry: *Proc. 24th Conf. Queensland Soc. Sugar Cane Tech.*, 1957, 81; *I.S.J.*, 1958, **60**, 162.

[7] Murry: *Proc. 25th Conf. Queensland Soc. Sugar Cane Tech.*, 1958, 45; *I.S.J.*, 1959, **61**, 82.

[8] *Tech. Report* (Sugar Research Inst., Queensland), 1958, (48); *I.S.J.*, 1959, **61**, 367.


. . . "since the economiser commenced to operate, we have experienced an extraordinary economy in fuel, which is due without any doubt to your equipment"
Ingenio El Modelo, S.A.
CARDEL, VER.
Charles.P.Dixon Esq.,
Messrs. E. Green & Son. Ltd.,
Apartado Postal No. 31,393,
Mexico. 20.D.F.
Dear Mr. Dixon;
Subject: GREEN's FUEL ECONOMISER.
I have for acknowledge your letter of the
18th.inst, in which you enquire regard the results obtained
from the Green's Economiser you have alled in this sugar mill.
I have pleasure in informing you that since the
economiser commenced to operate, we have experienced an extraordinary
economy in fuel, which is due without any doubt whatever to your
equipment.
We estimate that our consumption of auxiliary fuel
has dropped by approximately 50% as a result of the economiser, and
we will be pleased to advise you from time to time how we fare.
Over 24 hour periods of continuous operation, our
oil consumption has dropped to as little as 6 liters per ton of cane
ground.
I am glad to authorize you to use this letter as
a reference, and take this opportunity of expressing my appreciation
of the attention and personal service we have had during the erection
of the economisers, which incidentally, arrived within the period
promised.
RG-amo.

The Green's Economiser installation which has achieved such remarkable savings comprises a Premier Diamond Type 25 Economiser with 170 cast-iron gilled tubes 12 feet long. The installation of Green's Economisers is enabling the sugar industry, in many parts of the world, to effect material savings in the use of auxiliary fuel, or alternatively to cope with additional steam demand without increase in fuel consumption or additional plant.

E. GREEN & SON LTD. WAKEFIELD

Makers of economisers for more than 100 years

★ GREEN'S ECONOMISER

GS 214

Suma Products

VACUUM PAN CONTROL

The **CUITOMETER**, designed for use in pan boiling and crystallizer work, indicates the conductivity of the mother liquor and so enables the progress of the strike to be judged. We have deliberately refrained from calibrating in degrees of supersaturation as this, in our opinion, would be misleading since the relation between conductivity and supersaturation, besides varying with the purity of the grade of massecuite, will also change in the same mother liquor as sugar crystallizes out and the purity falls.

Emile Hugot, in his "Handbook of Cane Sugar Engineering" writes: "The Cuitometer is particularly useful for pans working on low grade massecuites, especially with C massecuites; but it is very useful with any massecuite, and it may be stated that today it is an indispensable instrument for the sugar boiler. Thanks to it, novice sugar boilers can boil as safely as a master boiler, and maintain the massecuite at the optimum point of supersaturation, without risk of false grain. **Each pan should have its Cuitometer. The relatively insignificant cost of this instrument permits of this.**"

(Extracted by kind permission from "Handbook of Cane Sugar Engineering" (p. 517) by E. Hugot, translated by G. H. Jenkins (Elsevier, Amsterdam). 1960. Price: 170s. 0d.).

The graining point can be **watched** through our **PANOSCOPE** pan microscope. A special 16 mm. objective is now available which will give a magnification of ×170 with full extension of the draw tube. The pansman may then use the standard ×65 magnification eyepiece for checking false grain, and may measure the final crystal size with the ×20 eyepiece.

Write now for details of our complete range of factory and laboratory equipment.

The Sugar Manufacturers' Supply Co. Ltd.

7 & 8, IDOL LANE, LONDON, E.C.3, ENGLAND.

Cables: "Sumasuco, London."

$$F_F = D \int_{\beta}^{\alpha} p_v \frac{\tan\theta - \mu}{1 + \mu \tan\theta} \cos\theta \, d\theta$$

and since $\mu = \tan\beta$

$$F_F = D \int_{\beta}^{\alpha} p_v \tan(\theta - \beta) \cos\theta \, d\theta \quad \ldots\ldots\ldots (8)$$

The pressure p_v is known as a function of compression ratio. The compression ratio C_θ at any angle θ is given by

$$C_\theta = \frac{\text{no void volume of original cane}}{\text{volume occupied at present conditions}}$$

The volume crossing any section is equal to the product of the height of that section and the speed of the material at that section. That is,

$$V_\theta = h_\theta \times S \cos\theta$$
$$= D\left(1 + \frac{W_o}{D} - \cos\theta\right) S \cos\theta$$

If C_o is the compression ratio of the mill given by

$$C_o = \frac{q_c}{d_o S W_o} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

d_o = no-void density of cane = 71 lb per cu.ft.

the volume of cane entering the mill is

$$\frac{q_c}{d_o} = C_o S W_o$$

hence

$$C_\theta = \frac{q_c/d_o}{V_\theta} = \frac{C_o S W_o}{D\left(1 + \frac{W_o}{D} - \cos\theta\right) S \cos\theta}$$

or

$$C_\theta = \frac{C_o \frac{W_o}{D}}{\left(1 + \frac{W_o}{D} - \cos\theta\right) \cos\theta} \quad \ldots\ldots\ldots\ldots (10)$$

The required feed force may now be calculated from equation 8 with the aid of equations 7 and 10.

8. Relationship Between C_o, C_N and $\frac{W_o}{D}$

From equations 3 and 9

$$\frac{C_N}{C_o} = \frac{d_o}{d_a} \frac{W_o}{D} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

The compression ratio of the material in the feed chute to the mill is B (see section 6).

$$B = \frac{q_c}{d_o} \div \frac{q_c}{d_a} = \frac{d_a}{d_o}$$

Hence we see that $B = \frac{d_a}{d_o}$ is a measure of the fineness of the preparation as suggested before.

9. Feed Pressure

It has been found convenient to calculate the feed pressure p_F (feed force per unit area of section at entry) rather than the feed force F_F. For unit length of roll

$$p_F = \frac{F_F}{h_a}$$

Substituting in equation (8)

$$p_F = \left[\int_{\beta}^{\alpha} p_v \cos\theta \tan(\theta - \beta) \, d\theta\right] \div \frac{h_a}{D} \quad \ldots\ldots (12)$$

From equations 2 and 4

$$h_a = D\left[\frac{1}{2}\left(1 + \frac{W_o}{D}\right) - \sqrt{\frac{1}{4}\left(1 + \frac{W_o}{D}\right)^2 - C_N}\right] \ldots (13)$$

No analytical solution of these equations has been attempted but numerical solutions are fairly easy to obtain. A sample calculation is given in Part II which discusses the comparison of this theory with experimental results. A tabular method of solution is given which enables a result to be obtained by arithmetical computation only.

(to be continued)

BREVITIES

New sugar factory for Mexico[1].—A new sugar factory with a daily crushing capacity of 5000 tons of cane is to be erected to the north of the state of San Luís Potosí.

* * *

Jordan sugar refinery tenders.[2]—Tenders for construction of a sugar plant in Jordan acceptable up to 10th November, are for a refinery of 50,000 tons annual output. It is to be operated by The Sugar Refinery Company which has been formed with a capital of £500,000.

* * *

Cuban sugar mill to be dismantled[3].—Central San Ramon in Oriente Province, it is reported from Havana, is to be dismantled and its cane supplies diverted to the nearby Central Santa Regina. The dismantling was decided upon by the "Syndicate of Sugar Workers".

* * *

Queensland sugar sale to Canada.—120,000 tons of Queensland raw sugar has been sold by The Colonial Sugar Refining Co. Ltd. on behalf of the Australian sugar industry to The Atlantic Sugar Refineries Ltd. of Canada. The contract provides for spread delivery throughout 1961.

* * *

Guadeloupe crop reduction[4].—As a result of persistent drought, sugar production in Guadeloupe is estimated to amount to 140,000–150,000 tons. In 1958 production was 141,962 tons, but production capacity is far higher than these figures suggest; under favourable circumstances the island would be able to produce about 250,000 tons of sugar.

[1] F. O. Licht, *International Sugar Report*, 1960, **92**, (9), 90.
[2] *Willett & Gray*, 1960, **84**, 389.
[3] *Lamborn Statistical Dept.*, 16th September 1960.
[4] F. O. Licht, *International Sugar Report*, 1960, **92**, (9), 90.

SUGAR-HOUSE PRACTICE

Method of operation and application of continuous centrifugals in the sugar industry. W. DIETZEL. *Zucker*, 1960, **13**, 358–364.—The different types of continuous centrifugals are reviewed, including the push-type and screw-type (or Elmore centrifugal) and particularly the conical centrifugal. The advantages of the BMA continuous centrifugal are discussed, and results tabulated for C-massecuites cured in discontinuous and BMA continuous machines in 4 different sugar factories (1 Mexican, 2 Belgian and 1 German). These show an increase in pol of 0·6–2·2 units and a decrease in molasses purity of 0·3–1·2 units. One disadvantage of the machine is pointed out: about 15% of the sugar crystals, based on the most usual grain size, are broken on the wall of the casing when the cured sugar is discharged. However, if the cured sugar is to be re-dissolved this has no significance.

* * *

Is cleaning of evaporator surfaces empirical? B. ARCE. *Bol. Ofic. A.T.A.C.*, 1960, **19**, 161–165.—Attention is drawn to conflicting recommendations and reports in the literature concerning cleaning of scale from evaporators by treatment with acid and alkali.

* * *

Mud filtration through the "Fas-Flo" filter. D. K. LUKE. *Paper presented to Amer. Soc. Sugar Cane Tech.*, 1960.—The "Fas-Flo" filter is described and details are given of the clarifier mud treatment at Villanueva, Honduras[1], where one 540-sq.ft. filter removes about 5292 lb of mud per cycle. The cake is sweetened-off to 5·8% sucrose content without dilution. The question of the extent to which filter-cake should be sweetened-off is discussed.

* * *

Technical aspects of theoretical mill settings. A. B. CHIRGWIN. *Paper presented to Amer. Soc. Sugar Cane Tech.*, 1960.—Calculation of theoretical bagasse openings is discussed, together with the application of empirical factors to calculate cane and turnplate openings. Graphs are presented of bagasse moisture in bite *vs.* bagasse moisture after bite, and of roll openings at various moisture fibre ratios. Numerous data are tabulated with a typical work sheet for mill settings.

* * *

Observations on the chemical cleaning of heat transfer surfaces. R. MOROZ. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The maintenance of heating surfaces in the melt heater, clarifiers, evaporator and calandria pans at the Sucrest refinery is discussed. Chemical technique and scheduling of cleaning during three periods of refinery operation are noted: (1) before the ion-exchange installation with chemical treatment of scale using hydrochloric acid and sodium hydroxide (2) after the ion-exchange installation with chemical treatment as in (1); (3) after the ion-exchange installation with chemical treatment of scale with sulphamic acid and "Rodine 115." Some data are also presented on the composition of the scale and corrosion that occurs in the particular equipment in question.

* * *

Steam economy and power. W. S. FACEY. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—A brief description of equipment is given along with types of fuel and the percentage of each type used. The method of operation is discussed, including current routeing of steam through the plant and the main users, giving their percentage of total steam and pressure. Current values relating to boiler and turbine operations are presented, as is the expected trend of power and steam requirements. Proposed changes to increase efficiency are outlined, including fuel economy and turbine changes. The use of pan and evaporator vapour to reduce steam requirements is discussed and data given.

* * *

Time-temperature patterns related to crystallizer performance. F. W. SCHWER and S. P. SMALL. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The importance of handling technique in a crystallizer was studied using a crystallizer equipped with a programmed temperature controller in order to evaluate the influence of the cooling curve pattern on efficiency of operation. Factors such as rate of purity drop, sugar destruction, need for adding water and power required are discussed in connexion with two experimental patterns.

* * *

Recent developments in vacuum pans. R. S. PATTERSON. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—Materials of construction used in recent years for pans and mixers are discussed, and results of a survey are given. Experience with different materials is discussed in instances where this experience is available. Results of exposure of test plates in various sugar liquors and syrups at California & Hawaiian Sugar Refining Corporation are presented. Operating characteristics of three new stainless steel pans and their mixers at Crockett are covered. These pans have low-head calandrias and are equipped with circulators. The instrumentation is described. Other items concerning the construction of these pans are discussed briefly.

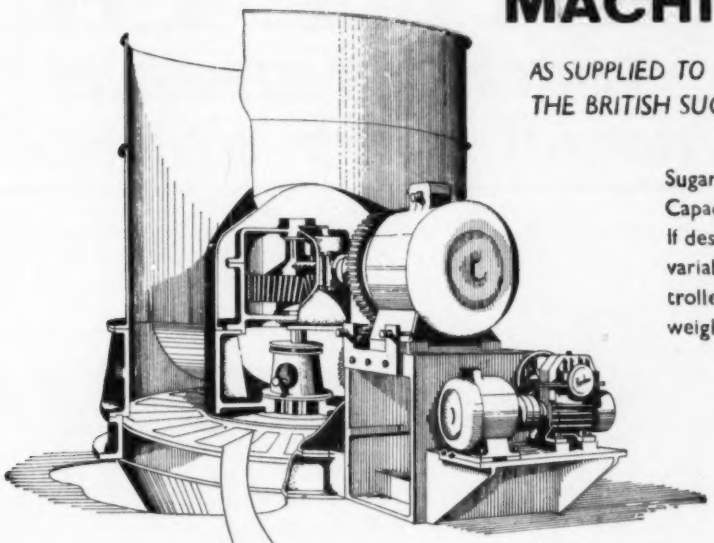
* * *

Colour development in process operations. F. M. CHAPMAN, J. M. HUTSON and P. HONIG. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The fact that colour is an expensive impurity, because of its removal cost and because of the sugar losses involved when the colour is formed during process, is discussed. Results of

[1] *See also I.S.J.* 1960, **62**, 190.

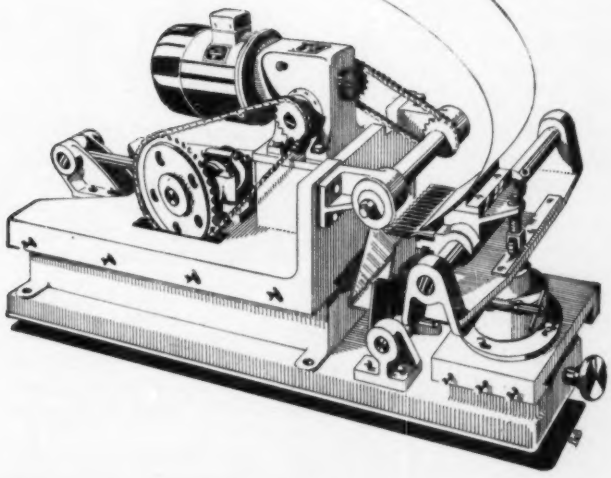
BEET SLICING
and
AUTOMATIC KNIFE SHARPENING MACHINES

AS SUPPLIED TO
THE BRITISH SUGAR CORPORATION LTD



Sugar Beet Slicing Machine. Capacity 1,200 tons/24 hrs. If desired can be fitted with variable speed drive controlled by cossette band weigher.

Automatic Knife Sharpening Machine for coarse and fine sharpening.



COCKSEDGE & Co. LTD

Telephone
Ipswich 56161 (5 lines)

IPSWICH ENGLAND

Telegrams
'Cocksedge, Ipswich'

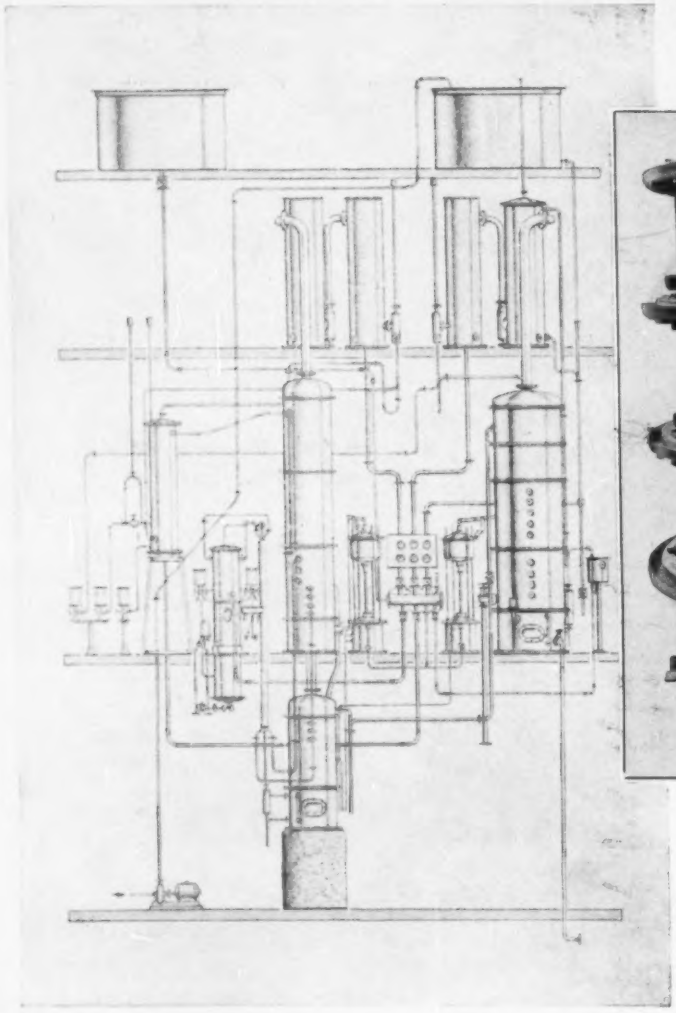
BLAIRS

COMPLETE

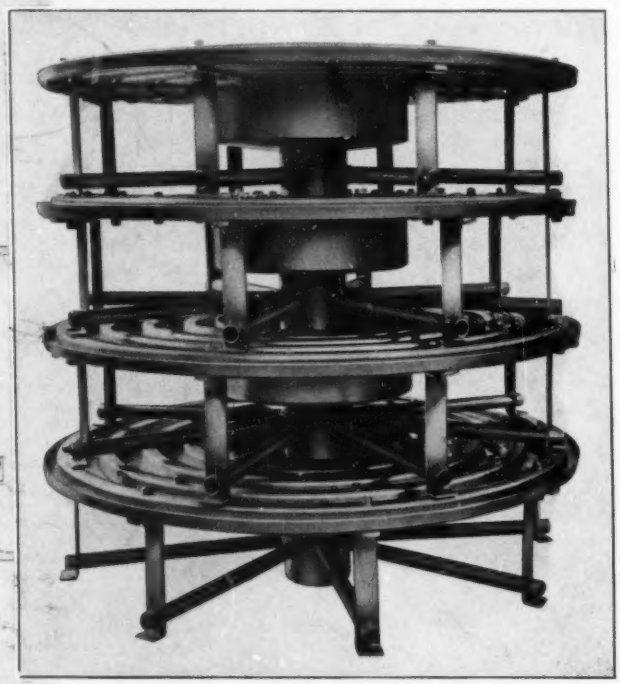
SUGAR

FACTORIES & REFINERIES

DISTILLERIES, ABSOLUTE ALCOHOL & CHEMICAL PLANTS



Our illustration shows a Double Column Continuous Working Steam Still designed to treat molasses wash.



Stills fitted with Kuhni Plates (*illustrated above*) have these advantages:

30 per cent. saving in Steam and Water Consumption; Smaller Columns; Greater Efficiency;

Kuhni Plates can be fitted to existing columns to replace bubbler cap and nozzle type plates.

Sole Makers of
MULTIPLEX FILM
EVAPORATORS

BLAIRS LIMITED
WOODVILLE STREET GLASGOW, S.W.1
Cables : "BLAZON GLASGOW"
London Office : **38 Grosvenor Gardens, S.W.1** *Cables :* "Multivap Sowest London"

preliminary investigations on colour formation in Tate & Lyle refineries are briefly reported and a summary given of the 1957 C.I.T.S. reports (*q.v.*)

* * *

The use of disposable pallets in the warehousing and storage of refined sugar in packages. H. G. GERSTNER and L. J. LOUSTEAU. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The system of palletizing bags and bundles on disposable fibre-board pallets at Colonial's Gramercy refinery is outlined and discussed. Items are palletized mechanically by means of a semi-automatic palletizer, and then handled on disposable pallets to storage and/or carriers. The use of "Pul-pac" trucks in loading the various forms of transportation (barges, cars and trucks) is discussed. Significant labour saving has resulted, and less damage in warehouse and during shipment.

* * *

Fluidized bed cooler—granulated sugar. P. H. PETRI. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The operation of a pilot plant is described, which consists of a 27-in dia. fluid bed designed to cool sugar to temperatures required by the trade. Auxiliary equipment includes one or more blowers, a cyclone and an adjustable feed screw. The column is filled to the bed height with sugar and air admitted through a specially designed bottom distributor plate. Air volume is regulated to obtain a properly fluidized bed. A series of vertical plates, mounted inside the column, provide the necessary heat transfer surface. Water at varying rates and temperatures can be circulated through these plates. A tabulation of the data obtained includes air, water and sugar rates and temperatures as well as the overall heat transfer coefficient and a heat balance.

* * *

Some factors affecting the properties of bulk granulated sugar. L. E. MAHONEY and W. L. REED. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The handling of bulk granulated sugars is discussed, with a report on the effects of Kathabar cooling, ageing and other properties of the system. An attempt is made to evaluate some of the chemical characteristics with their physical behaviour.

* * *

Bulk storage and handling of granulated sugar. G. CONSTABLE. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The approach made by the St. Lawrence Sugar Refineries Ltd. to the problems of proper conditioning and storage of bulk sugar is outlined and views given on the conditioning requirements. The system adopted consists of 10 storage bins each of 120,000 pounds capacity and suitable conveying equipment for charging the bins and locating rail or road transport. Provision is also made for recirculation to the storage bins, which are made of glass fibre. The conveying system, method of obtaining sugar from production runs, conditioning apparatus and operating statistics are discussed.

* * *

The Brookfield Distribution Terminal (Chicago), its automation and operation. W. NEWTON. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The handling and operation of bulk granulated and liquid sugar at the terminal station are described. The plant features include automation of a batch system for liquid sucrose and invert production, and the incorporation of timers in the circuit, with the result that the operator merely pushes a button to start either the dissolving cycle or the inversion cycle. Filtration of the syrups is accomplished manually on horizontal plate cartridge-type filters.

* * *

Circulation pumps a necessity in the case of continuous liquor carbonatation and sulphitation tanks. C. G. M. PERK. *S. African Sugar J.*, 1960, **44**, 590–591, 593.—The pros and cons of circulation pumps for carbonatation tanks are discussed, as well as the number of tanks required for continuous carbonatation or sulphitation. The discussion is based on the equipment installed in the Toronto Redpath refinery[1]. Lime metering devices and rotary filters are also considered.

* * *

Effectiveness of save-alls. C. G. M. PERK. *S. African Sugar J.*, 1960, **44**, 593.—The performance of save-alls is discussed, and in particular the Stillman save-all[2].

* * *

Handling mud filtration through the "Fas-Flo" filter. D. K. LUKE. *Sugar J.* (La.), 1960, **23**, (2), 27–30.—See *I.S.J.*, 1960, **62**, 350.

* * *

Fondant seeding, graining on B.H. (B heavy molasses) and production of only one quality sugar. K. H. PAREKH. *Proc. 16th Conv., Deccan Sugar Tech. Assoc.* (*India*), 1959, 1–5.—The application of fondant seeding has permitted graining on B syrup of 60–62 purity to give a C massecuite of uniform grain, the curing of which has improved. The improved boiling with absence of false grain has resulted in a final molasses purity drop from 34 to 32. The boiling system has been changed from 4 to 3-massecuite; the double-cured C massecuite being used as seed for B massecuite and single-cured B massecuite being used as seed for A massecuite.

* * *

Notes on observations about the working of Dorr clarifiers. K. A. JOSHI and O. P. BHARGAVA. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 13–19.—Certain questions are posed regarding the operation of Dorr clarifiers and Oliver vacuum filters, and particularly mud withdrawal, juice retention during the weekly shut-down, periodic liquidation, pH drop and periodic washing of Oliver

[1] *I.S.J.*, 1960, **62**, 132.
[2] *I.S.J.*, 1923, **25**, 591.

filters with caustic soda. Recommendations are invited, though some answers are already provided, based on the operations at Sakarwadi factory.

* * *

Minor improvements in clarification and boiling house thoughts on useful devices in sugar factories. B. B. BANDI. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 63–72.—A lime metering device is described, comprising a constant-level lime tank with a slide gate located at the point of discharge to the juice line and operated remotely by a level which also acts as a gauge for variable doses. Excess milk-of-lime flows over a weir back to the supply tank. A diagram is presented of an inclined modified toggle pan gate valve which may be operated by one man. A bagasse dryer design is also given. In this the wet bagasse is discharged onto a conveyor and passed together with boiler flue gasses to a cyclone dust trap, which prevents bagasse being lost through the gas vent. The bagasse then continues to the boilers. The Eimco "RotoBelt" filter[1] is discussed.

* * *

Low-grade massecuites and their treatment. P. V. S. SASTRY. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 126–130.—Boiling and crystallization of low-grade massecuites is discussed, from such angles as circulation, purity, exhaustion, decreasing viscosity with such chemicals as manganese sulphate, Na hydrosulphite and EDTA, cooling in crystallizers and re-heating. Data from the author's factory are tabulated.

* * *

Cooling of B massecuite in Werkspoor crystallizers at the Kolhapur Sugar Mills Ltd. CHEMICAL STAFF, KOLHAPUR SUGAR MILLS LTD. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 151–154.—When the A massecuite purity rose to 92, it was decided to use the set of 3 crystallizers to cool B massecuite and thereby prevent the C massecuite purity rising. On 2 out of 5 occasions a B heavy molasses purity of 54·45 and 55·14 was obtained, permitting the boiling of the C massecuite to 60 purity. Although a B massecuite purity of 84 is envisaged owing to the high A massecuite purity (this is necessary to meet the demand for improvements in the colour of commercial sugar), a C massecuite purity of 60 is still considered possible on a graining purity of 70 and with a ratio of graining volume:final massecuite of 1:14. The heavy molasses from the double-cured C massecuite might be used to top-up the C massecuite.

* * *

A new approach to filter-press working. D. G. PAGALRAR, J. V. MANTRI and V. S. PADALKAR. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 155–162.—Filter-press capacity at the Ugar Sugar Works Ltd. was increased by reducing the pressure from 40 lb to 20 lb, filtering mud for 40 min. per press, then washing each press with water (1 hr) and steam (1 hr), and emptying 10 to 13 presses per shift. Filter cloth consumption fell by 10–15%, no plates or frames were broken, and the purity drop from clear press juice was 0·38 units lower, at about 2·00. Two-stage washing or using the last washing for maceration will reduce wash water % cane requirements.

* * *

Some notes on the working of low-grade stations in Deccan sugar factories. CHEMICAL STAFF, KOLHAPUR SUGAR MILLS LTD. *Proc. 16th Conv. Deccan Sugar Tech. Assoc.* (India), 1959, 163–178.—The various aspects of low-grade working in 21 Deccan sugar factories are discussed with tabulated data.

* * *

Technical aspects of theoretical mill settings. A. B. CHIRGWIN. *Sugar J.* (La.), 1960, **23**, (3), 27–31.—See *I.S.J.*, 1960, **62**, 350.

* * *

Automatic control of centrifugals. F. BROADBENT and G. L. GRIMWOOD. *British Chemical Engineering*, 1960, **5**, 614–617.—The various types of centrifugal control are discussed, including sequence and timing controls, and control of feed and speed. A diagram is presented of a typical cycle of operation for a sugar centrifugal. Safety and the layout of equipment are also considered.

* * *

China plans 2·4 million ton production in 1962. R. WESTGATE. *Sugar y Azúcar*, 1960, **55**, (8), 23–25.—A review of the sugar industry of Mainland China is given with illustrations and details of the production targets.

* * *

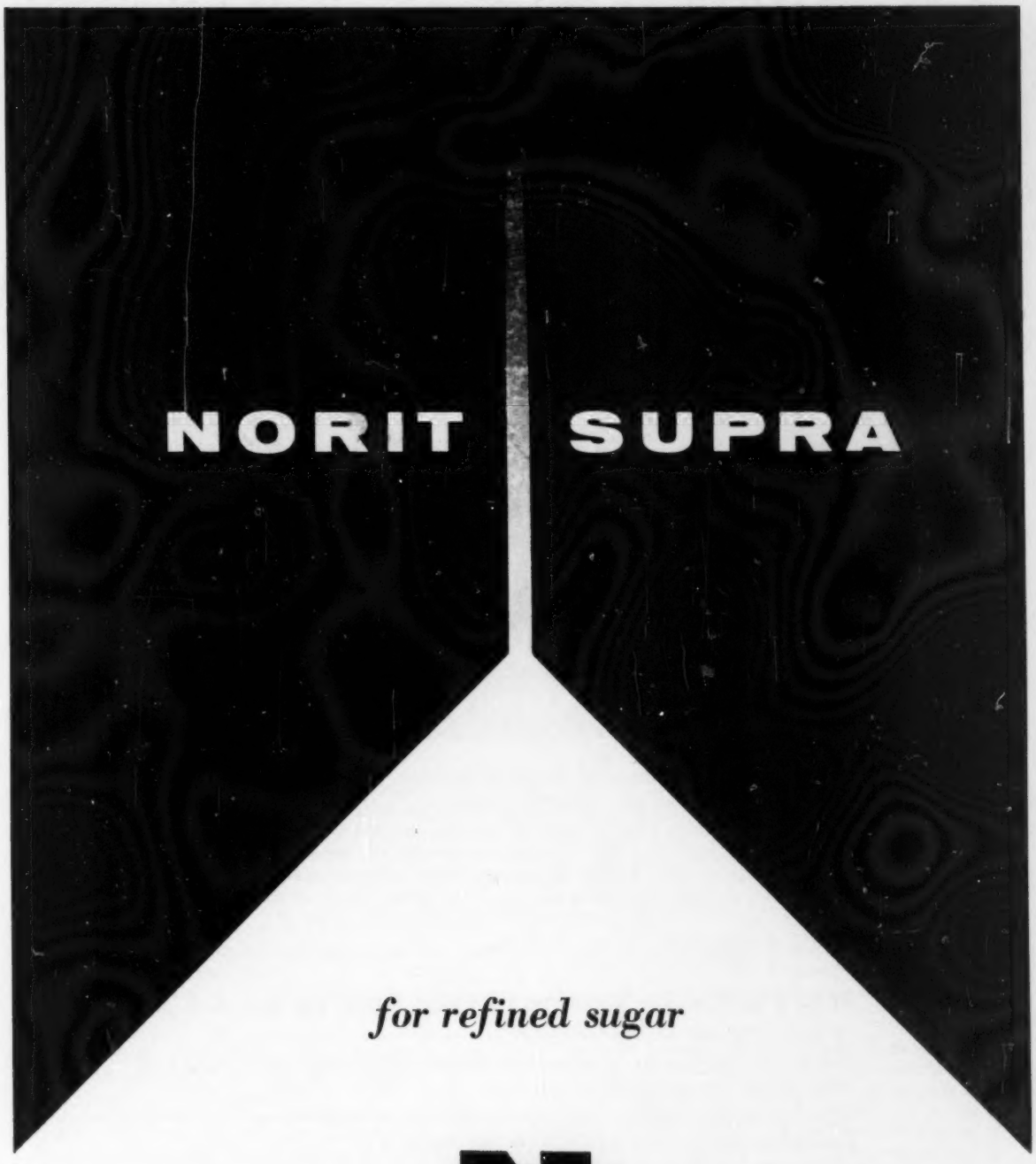
The first automatic sugar refinery in Central America. G. O. WINTER. *Zeitsch. Zuckerind.*, 1960, **85**, 414–417.—The San Salvador refinery, built by Buckau-Wolf for production of 140 metric tons of refined sugar daily, is described with illustrations.

* * *

Changes in the length of the centrifugalling cycle with changes in the mechanical parameters of the centrifugal.[2] K. A. BORTNOVSKII. *Izvest. Vysshikh Ucheb. Zaved. - Pishch. Tekhnol.*, 1960, **16**, (3), 116–121.—Variation in the time of the centrifuging process is discussed mathematically on the basis of changes in the maximum speed of rotation of the basket, in the power of the electric motor and in the values of the angular speed of the basket at the end of the charging stage. Variations in the rotary speed of the basket during acceleration are also considered. The formulae derived permit comparative evaluation of the efficiency of centrifugals differing from one another in the parameters already mentioned. A sample calculation is appended.

[1] *I.S.J.*, 1960, **62**, 223.

[2] *See also* BORTNOVSKII: *Trudy Kiev. Tekhnol. Inst. Pishch. Prom.*, 1958, **19**, 160–171; *I.S.J.*, 1959, **61**, 371.



for refined sugar

No-4-30

NORIT

UNITED NORIT SALES CORPORATION LTD - AMSTERDAM - HOLLAND

Caught in the Very Act

Children are very fond of sugar, it is true.

But this is no excuse for eating it on the sly since one must pay for the sugar in the daily diet. Before the housewife can buy it, sugar must undergo several technical processes unknown to her. Nevertheless, she does know that high quality sugar can be readily recognized by its brilliant sheen and sharp-edged crystal shape, even though she is unaware of the fact that these qualities can be achieved only by gentle but none the less thorough, drying.

However, if the housewife does not know it, sugar specialists do - and they choose the

BUTTNER-Turbo-Tray Dryer and Cooler

for the final stage of sugar refining.

The BUTTNER Dryer is the accepted means for drying sugar gently and thoroughly with negligible abrasion.

Other advantages held in high esteem by sugar specialists are:

unusually low power and heat requirements

continuous and trouble-free operation

minimum supervision

either packaging or storage in silos immediately after drying.

Please ask for our detailed leaflets and the advice of our Engineers.

Subsidiary Companies: U. S. A.: Buttner Works Inc. · 52 Vanderbilt Ave. · New York 17, N. Y.
Canada: Buttner-Works (Canada) Ltd. · P. O. Box 688, Montreal P. Que.
Licensee: for Great Britain and South Africa: Buell (1952) Limited · 3, St. James's Square, London S. W. 1
Agencies in all Central and South American Countries, India, Japan etc.

BÜTTNER GEGR. 1874

BÜTTNER-WERKE AKTIENGESELLSCHAFT **KREFELD-UERDINGEN**

Effect of nutrient deficiency and virus yellows on respiratory losses of sugar in stored sugar beet. O. NEEB and H. GRUPE. *Zucker*, 1960, **13**, 348–357.—Tests were conducted on beets grown in plant pots containing quartz sand, which were subsequently stored at a constant temperature of 15°C. It was found that the respiratory sugar losses increased considerably during 6 weeks' storage, and that respiration with regard to beet surface and fresh weight increased sharply in the case of K, Mg, Mn and B deficiencies. The respiration increase was significant in virus-infected beet only at 5°C. Regarding the surface, the respiration increase was about 150% with a K deficiency and 65% with a B deficiency. Results of metabolic measurements from Warburg tests conducted on leaves during growth only partially corresponded to the beet respiration. Considerable increases in the O_2 consumption of the leaves were found only with K and Mn deficiencies and in virus-infected beets. The infected beets also revealed a definite reduction in photosynthetic capacity.

* * *

Work of the Hungarian Sugar Research Institute in the field of continuous juice extration. M. TEGZE and K. VUKOV. *Zuckererzeugung*, 1960, **4**, 196–201.—The work of the Hungarian Sugar Research Institute on continuous diffusion is reviewed and the J-diffuser, the outcome of this research, is described with some performance data.

* * *

Investigation of the scheme of multi-stage defeco-saturation. A. K. KARTASHOV, YU. D. GOLOVNYAK, R. G. ZHIZHINA and N. A. MAKSIMOVA. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 50–60.—Laboratory tests were carried out on single-, two- and three-stage BMA defeco-saturation, in which the saturation vessel consisted of a tank with central circulation tube mounted on a rotatory disc of dia. only slightly less than that of the vessel. CO_2 was fed through holes in the disc into the tube and milk-of-lime from the top. Raw juice from long-stored beets of variable quality was processed, the pH being controlled manually in some tests and potentiometrically in others. For stages 1, 2 and 3 the pH values were 9, 10 and 10·8–11·0 respectively. Alkalinity, lime content, and time of filtration of 250 ml of juice at 1 atm pressure and 80°C, initial settling rate and mud volume after 25 min were determined. Inter-comparison and comparison with standard carbonatation with and without return of saturated 1st carbonatation juice to pre-liming was carried out. With manual pH control, 3-stage defeco-saturation gave a higher filtration rate than single-stage and considerably higher than standard carbonatation, but the colour of the 2nd carbonatation juice rose even when the 3rd stage was shortened and the same filtration rates were obtained. Settling of the same juice during the first 5 min was as with normal carbonatation juice. With automatic pH control there was negligible difference between the filtration rates for the different numbers of stages, while the rate for normal carbonatation juice with 100% return and 1·3% CaO consumption was approximately twice that of defeco-saturation juice. The difference disappeared at 2·0% CaO. The colour of the normal 2nd carbonatation juice was 33%–50% lower and the lime salts content 50–100% higher than those of defeco-saturated juice. The purity of the normal juice was also slightly higher. There was little difference in settling. Although the normal juice settled out 33–50% slower and the mud volume was 1·8–2 times greater, the absolute settling rates for the defeco-saturation juice did not exceed 5·5 cm/min, i.e. lower than claimed by BMA. Adding sodium polymethacrylate or alginate to 1st carbonatation juice as a 1% aqueous solution to give a concentration in the juice of 1 mg/litre increased the initial settling rate of the defeco-saturated juice to 20 cm/min (somewhat less with alginate), and the mud volume increased by only 30%. Addition of 0·5 mg/litre polymethacrylate to 2nd carbonatation juice with 0·3% CaO increased the settling rate to 25 cm/min, giving a transparant supernatant. Return of thickened 2nd carbonatation muds to defeco-saturated juice gave a 12–48% lower filtration time than without return.

* * *

Molasses de-sugaring by the Assalini-B process in a pilot plant. H. SCHIWEK. *Zeitsch. Zuckerind.*, 1960, **85**, 342–349.—Details are given of pilot-plant experiments with the Assalini-B process[1]. The plant includes one anion- and one cation-exchanger with a loading of 0·9 cu.m./hr./cu.m. resin, corresponding to a flow rate of 2·5 cm/min. At diluted molasses dry solids content of 48–49°Bx, the purity of the concentrated product was over 80, while an average of 7·5% of the original pol sugar was lost in the waste water. At a molasses dry solids content of 51–52°Bx, the purity of the product was 73. The raw sugar obtained by boiling the recovered product was affined and had a pol of 99·6, a moisture content of 0·11%, an ash content of 0·05% and an invert content of 0·08%. Further de-mineralization of the Assalini

[1] *See* SCHIWEK: *I.S.J.*, 1960, **62**, 102; also *I.S.J.*, 1960, **62**, 232.

product by ion exchange gave a thin juice of 9·5–10·5°Bx, with a purity of 93–95, and an ash content of 1·0–1·5%. This de-mineralization process is designed to prevent overloading of the evaporators during the campaign. As an alternative to molasses, green B-runoffs may be processed.

* * *

Some remarks on the carbonate process[1]. S. VAJNA. *Zeitsch. Zuckerind.*, 1960, **85**, 354–356.—The process, a modified version of the so-called "SCC" process, is reviewed and certain discrepancies in the claims are pointed out. The question is posed as to whether the advantages of the complicated process justify the very high initial outlay and the complexities of the plant. The calculation of the economics is also criticized.

* * *

The charging of rotating suspended centrifugals by means of a pressure charging device. P. FRICKE. *Zeitsch. Zuckerind.*, 1960, **85**, 357–358.—A charging device which has been in operation at Nordstemmen for 3 years on centrifugals curing A- and middle-product massecuites is described. It comprises a pressure tank with feed valve, the massecuite being fed direct from the mixer and not via the distribution trough. There are a number of feed nozzles one above the other, ensuring even and rapid distribution around the basket wall. An experimental plant is in operation at Frellstedt refinery with a capacity of 25–30 charges/hr. Advantages include increased capacity of over 20% and even distribution of difficult massecuites.

* * *

The sugar industry in Yugoslavia. M. NIKITOVIČ. *Zeitsch. Zuckerind.*, 1960, **85**, 359–362.—Details are given of the industry and of the beet agriculture in Yugoslavia. The 9 factories, two with daily slicing capacities of 3000 tons of beet, are expected to produce 247,000 tons of sugar in 1960/61, based on a 100 days' campaign and a sugar yield of 13%. The erection of a further 13 factories and extension of one present factory by 1966 are being considered. This would more than double the sugar production, required to meet an envisaged per caput consumption of 23 kg sugar, equivalent to 460,700 tons of sugar for the country.

* * *

Carbonatation of calcium hydroxide in sucrose solution by carbon dioxide. R. KOHN and J. VAŠÁTKO. *Listy Cukr.*, 1960, **76**, 156–162.—A potentiometric method[2] was used to study the binding of CaO in the basic precipitate and in $CaCO_3$-sugar complexes during batch carbonatation at 20°C and 80°C during 8–26 min. The rate of reaction of the CO_2 was also studied, this too being dependent on the degree of neutralization of the $Ca(OH)_2$. Graphs are presented of the results, which show that at 20°C nearly all the CaO is bound in the basic precipitate and complexes, the amount of CaO bound rising with decrease in time of carbonatation. The CaO absorption at 80°C was studied quantitatively after vigorous defecation and only qualitatively after moderate liming, the latter because of the presence of a quantity of undissolved $Ca(OH)_2$. The rates of the CO_2 reaction after vigorous and moderate liming differed considerably; apparently the CaO passes into solution from the basic precipitate and the complexes much more slowly than dissolving of the $Ca(OH)_2$ particles in the milk-of-lime. In all the tests, addition of $CaCO_3$ particles had a favourable effect on the final stage of carbonatation, with considerably less CaO bound in the basic precipitate and the complexes. There was no difference in the rate of reaction of the CO_2 with and without addition of $CaCO_3$.

* * *

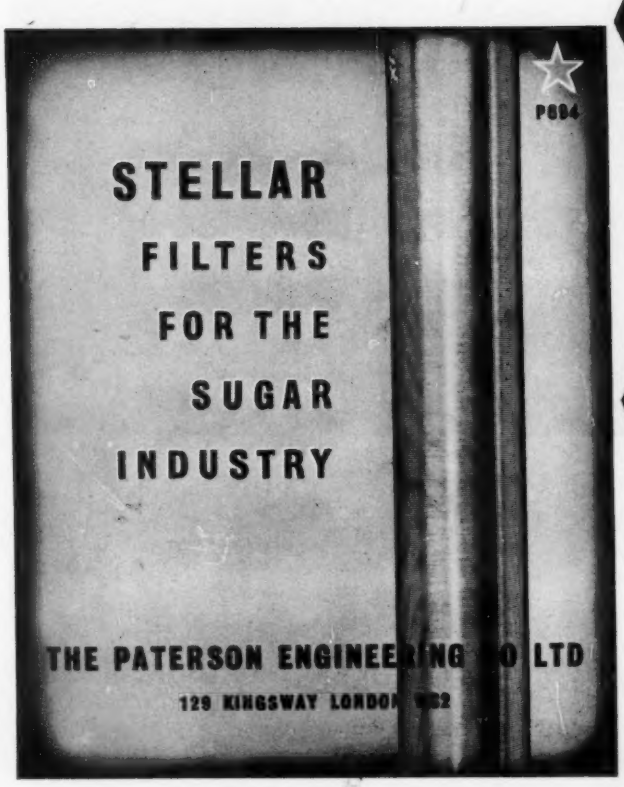
Impurities in diffusion juices and press waters. P. L. DEVILLERS and M. LOILIER. *Ind. Alim. Agric.*, 1960, **77**, 463–469.—Diffusion juice and press juice samples were analysed and the sugar and impurities contents compared. Data are tabulated for the press juice and for the corresponding battery diffusion juice with various feed waters and for continuous diffusion juice from BMA, DdS, Olier and RT diffusers. The alcohol-insoluble impurities in the press juice varied from 6 to 9% on sugar, while in the diffusion juice the range was 2·5–10%. The impurities content of battery juice was generally lower than that of press juice. The soluble impurities contents of press and diffusion juice were similar. The alcohol-insoluble substances in press water varied from 30 to 160% on sugar, and recycling press water to diffusion may increase the insolubles content of diffusion juice by 20% above the normal. However, return of press water is recommended as it will yield a certain amount of extra crystallizable sugar; but the extra purifaction necessary to remove the impurities increase must be borne in mind. Analysis of samples taken at the start, end and during diffusion showed that the proportion of impurities falls during the process, the insoluble impurities decreasing more than the soluble. The soluble nitrogenous impurities content remains almost constant while the non-nitrogenous organic acids and metals contents are higher at the tail.

* * *

Observations during operation of a Quentin plant. R. HOFFMANN. *Zucker*, 1960, **13**, 380–387.—Details are given of the Quentin process[3] of B-molasses purification at Schleswig sugar factory. Each stage of the cycle is described, including sweetening-on, ion exchange, sweetening-off, back-washing, regeneration, and de-mineralization. Calculations are presented to show that an extra 0·29% of sugar on beet was produced. Certain modifications to the process are described, particularly those introduced in order to reduce the amount of salt solution used for regeneration and condensate consumption.

[1] *See* MOEBES: *I.S.J.*, 1960, **62**, 257.
[2] *See also I.S.J.*, 1958, **60**, 239.
[3] *See* QUENTIN: *I.S.J.*, 1958, **60**, 174; NEUMANN: *I.S.J.*, 1960, **62**, 47.

YOU MUST SEE THIS



It's the *new* booklet about a new filtration technique . . . STELLAR. In its pages are described and pictured the functions of Stellar Filters in the clarification and polishing of sugar syrups. You'll find it well worth reading. May we send you a free copy?

Write: Stellar Department
Paterson Engineering Co. Ltd.
129, Kingsway, London, W.C.2

RUTHS STEAM ACCUMULATOR
FOR FLACQ UNITED ESTATES SUGAR FACTORY, MAURITIUS
MADE BY COCHRAN & Co. ANNAN Ltd. SCOTLAND
CAMIONAGE MAXIME CAYEUX

One of the two Ruths Accumulators supplied to Mauritius

This steam user proved that

STEAM STORAGE

increased factory efficiency and production

As part of an expansion scheme Flacq United Estates Sugar Factory of Mauritius installed two Ruths Accumulators with the result that the existing boiler plant became capable of supplying steam at a steady pressure to the greatly increased process consumers. In addition the increased production is going on with improved efficiency.

The customer states ". . . it is beyond any doubt that the two accumulators . . . have to a very considerable extent helped in attaining this remarkable achievement".

Cochran, the makers of Ruths Steam accumulators, are glad to supply schemes to solve factory steam problems, and invite you to avail yourself of their experienced technical service.

RUTHS
Regd. Trade Mark

STEAM ACCUMULATORS

COCHRAN & COMPANY, ANNAN, LIMITED, 34 Victoria Street, London, S.W.1. Abbey 4441 and at ANNAN, DUMFRIESSHIRE, SCOTLAND. Annan 111

TAS/CH 680

Formulae are presented for calculation of the recovered sugar, based on the non-sugars and molasses yield and on the difference in equivalent weight of K and Mg. Changes in the true dry solids content during the Mg exchange must also be considered in the calculations.

* * *

Investigation into return of oversaturated 1st carbonatation juice to pre-defecation under factory conditions. A. K. KARTASHOV, Yu. D. GOLOVNYAK and N. A. MAKSIMOVA. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 19–24.—Details are given of comparative tests in which raw juice at 85°C was prelimed with one or two doses of milk-of-lime with return of oversaturated and normal saturated 1st carbonatation juice. The juice was limed to pH 11, held during 3 min, then main-limed during 5–6 min. The oversaturated juice alkalinity was 0·02–0·03% CaO. Results are given of unfiltered and filtered juice alkalinity, filtration time (as determined in a laboratory filter), settling rate during the initial 10 min and mud volume after 25 min. From each 1st carbonatation juice sample 1 litre was removed, brought to 2nd carbonatation alkalinity, filtered, evaporated and the syrup settled during 4 hr at 95–100°C. The alkalinity, purity, colour and lime salts content of the syrup before and after settling and of the juices were determined. Tests were also conducted with and without liming of the juice with 25, 50 and 100% return. Little difference was found in the various factors, although after settling the syrup darkened quickly when saturated juice was returned and the juice not limed. When the juice was limed, the oversaturated juice-return syrup was less heat stable. The absolute properties of both juice and syrup were better with than without liming of the juice. Generally, there was a slight bias towards return of normal saturated juice with liming of the pre-defecation juice to pH 11.

* * *

Optimum reaction (pH) of 2nd carbonatation juice. A. K. KARTASHOV, R. G. ZHIZHINA and N. A. MAKSIMOVA. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 25–49.—The literature of the last 20–30 years on 2nd carbonatation is reviewed. Tests were carried out to determine the optimum pH of 2nd carbonatation juice corresponding to the minimum Ca content, determined complexometrically with chromium blue and by a modified complexometric method previously described[1]. The pH was determined potentiometrically at 20°C. A number of graphs illustrate the relation between pH of the juice and CaO content. The optimum pH varied from 8·82 to 9·70 depending on juice quality. A deviation from the optimum pH of ±0·1–0·2 units resulted in an increase in the original CaO content by 0·84%–4·58% at 70°C and 1·42–5·76% at 95°C. This points to the need for very accurate control of carbonatation gas feed, and accurate pH regulation, as well as for adequate maintenance of heat to prevent Ca bicarbonate forming as a result of a surplus of gas. After filtration of some juice samples, the filtrate (500–700 ml) was placed in a flask, weighed, evaporated to syrup density, and the syrup diluted to original weight of juice and the Ca determined before and after evaporation. Heating the juice before evaporation with 1% pure Ca carbonate during 15 min resulted in only a very slight drop in the Ca content. The minimum Ca separation during evaporation was found with juices having pH values nearest the optimum. There was no Ca precipitation when juice of optimum pH was evaporated in the absence of added Ca carbonate, while the Ca content fell in 2 out of 5 tests with juice evaporated in the presence of Ca carbonate. At a pH lower and higher than the optimum, the Ca content fell after evaporation, with or without added Ca carbonate. Adding 0·3% Ca carbonate and 0·2% lime (both on juice volume) to 1st carbonatation juice did not prevent formation of a supersaturated Ca carbonate solution. Filtering the 2nd carbonatation juice through a carbonate mud layer on the filter-press is most effective in removing the carbonate supersaturation, whereas filtering on a clean press reduces the Ca content only slightly. The temperature of 2nd carbonatation between 70 and 95°C has no effect on optimum pH nor on the amount of carbonate in supersaturated solution. A mixer after the saturation vessels would obviate the need for strict pH control, as the Ca content of juices with pH values slightly above and below the optimum when brought to equilibrium is no different from that of juices with optimum pH.

* * *

A study of the percolation of extraction liquid in a layer of beet cossettes with respect to rotary diffusers. E. T. KOVAL', A. YA. ZAGORUL'KO and A. A. LIPETS. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 103–123.—The theory of irregular percolation through a layer of cossettes in a rotary diffuser is discussed mathematically. Laboratory tests were carried out with counter-flow diffusion using a column. Graphs of the results show that the cossette layer undergoes marked compression in the direction of flow of the juice, this being stronger the nearer the layer is to the screen surface, and particularly so with thin cossettes. The percolation rate increased considerably with cossettes of 13 m/100 g length with increase in hydrostatic pressure, although this would not apply to longer cossettes. The turbulent flow of the liquid may be expressed by the criterion $Ei = Re^{-0.45}Ho^{-0.45}$ for a wide range of cossette lengths and loadings per unit area of filter screen where Ei = Eiler's criterion, characterizing the ratio of pressure drop in the percolating liquid to its kinetic energy, Re = Reynold's number and Ho = criterion of homochronology, characteristic for those moments of time then processes in the juice flow through the layer are identical. On the basis of the experimental data, a method of calculating the surface of filter screens in the cells of rotary diffusers is presented with a worked example.

[1] KARTASHOV *et al.*: *I.S.J.*, 1958, **60**, 207.

Effects of rate of flow of extraction liquid on the coefficient of diffusion of sugar from beet tissue. E. T. KOVAL', A. YA. ZAGORUL'KO and A. A. LIPETS. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 133–138.—For determination of the diffusion coefficient, an extractor was used comprising a frame containing 25 cells 21 mm in dia. and 4·3 mm deep. This was placed inside a framework to which were connected two diametrically opposed funnels, one for liquid feed, the other for juice withdrawal. The beet was heated to 75°C during 60 min, cooled, cut into flat slices 4·3 mm thick and into cylindrical pieces, and placed in the cells. The extractor was heated in a vertical position to allow air to escape and water fed into the apparatus, which was then placed horizontally in a tank of water, circulated via a pressure tank by centrifugal pump. After 60 min diffusion the cossettes were removed, pulped and the sugar content determined. The flow rate of the water was determined from the width and height of the aperture in the extractor, the weight of water for a given time, and the temperature of the medium. Graphs of the relationship between diffusion coefficient and the flow rate at 0·55 cm/sec show that an increase in the flow rate of a laminar stream increases the extraction rate over the range in 3 stages, the greatest increases being from 0 to 4 and from 25 to 40 cm/sec. Increase of the flow rate from 6·5–7 to 20–25 cm/sec has hardly any effect on the extraction rate. At 43–47 cm/sec the thickness decreases to a minimum and the limited layer of beet ceases to have any considerably resistance to extraction. The third increase from 45 cm/sec is caused by penetration of the juice into inter-cell spares and destruction of the surface layers of tissue. The initial increase up to 6·5–7 cm/sec would considerably increase the extraction rate in a tower diffuser, in which the cossette-juice mixture flow rate is never greater than 0·5–1 cm/sec. At 7 cm/sec sugar losses might be halved and at 45–50 cm/sec reduced by almost 90%, or the retention time cut to 35–40 min; the best method of increasing juice flow rate in continuous diffusers is pulsation, using a special apparatus[1].

* * *

Questions of theory and calculation of a rotary continuous diffuser. E. T. KOVAL' and A. YA. ZAGORUL'KO. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 137–170.—The theoretical assumptions of A. SMET for evaluation of continuous rotary diffusers (single- and double-scroll) are analysed in great detail. It is shown that the formula for calculation of the equilibrium coefficient obtained by analogy with heat transmission in a parallel stream of heated medium and heat conductor on the basis of Fick's law in not applicable to single-scroll diffusers. The coefficient of equilibrium does not depend on the juice:cossette ratio. The SILVER formula for cell-divided diffusers, in which the juice:cossette ratio is equivalent to the coefficient of juice draught, is only applicable for partial description of the diffusion process in a double-scroll diffuser and not in a single-scroll diffuser. A formula is derived for direct-flow of cossette and juice in a single scroll diffuser, which by comparison on the basis of this and SILVER's formulae is shown to give better results than the double-scroll diffuser. This conclusion is confirmed by analysis of factory experimental data using SILIN's numbers. Analysis of cossette and juice flow shows that in a rotary diffuser, diffusion is a combination of direct-flow or infusion, counter-flow and cross-flow. Depending on the diffuser design and with limited loading, counter-flow diffusion during one revolution is 1·6–1·9 times greater than direct-flow. Hence, there is some basis for using equations of counterflow diffusion to describe the general diffusion process. The method of calculation described enables the most important factors to be evaluated at higher cossette loadings.

* * *

New method of comparative evaluation of diffusers of different systems. E. T. KOVAL', A. YA. ZAGORU'LKO and A. A. LIPETS. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 171–174.—Comparison of the performance of different types of diffusers on the basis of sugar losses is considered insufficient, when beet of variable quality and consequently variable permeability are processed. A new criterion is proposed, which eliminates the permeability factor. It is based on (1) the coefficient of utilization of the beet tissue diffusion potential, by which is meant the ratio of diffusion coefficient calculated from actual working conditions to the diffusion coefficient under laboratory conditions, and (2) the efficiency coefficient. Experimental data for a Buckau-Wolf and RT diffuser show that the value of (1) is greater for the Buckau-Wolf diffuser, but that the % diffusion potential for the cossettes utilized in both diffusers amounts to only 50. Reasons for this are enumerated.

* * *

Heat consumption in drying. F. BAUNACK. *Zucker*, 1960, **13**, 400–405.—Calculation of the heat consumed in drying sugar and beet pulp, and the effect of certain enumerated factors on the consumption are discussed. It has been found that to dry pulp from a moisture content of 82% to 10%, reducing the temperature of the air stream from 900 to 110°C, at least 750 kcal per kg evaporated water is required. Any heat economies may be effected only by vapour return. In the case of sugar drying, the conditions vary according to the method of curing and the initial water content. Two schemes are described for combined sugar drying and cooling, with and without vapour return. With the use of turbo-dryers and coolers at least 1150–1200 kcal/kg evaporated water is required, while with granulators and separate coolers the heat consumption may be as much as 1500 kcal/kg.

* * *

New method of purifying juice in the beet sugar industry. A. F. YAKIMOV. *Sakhar. Prom.*, 1960, (7), 17–21.—A scheme is described which includes defeco-saturation and carbonatation. Raw juice is mixed with returned carbonatation muds, pre-limed,

[1] *See also I.S.J.*, 1957, **59**, 189, 221.

What have these "warriors' shields" got to do with better product performance?

Among the hundreds of different types of particles found in Celite diatomaceous earth are these "warriors' shields." Shown here magnified hundreds of times, are, from left to right, *Navicula splendida, Raphoneis amphiceros* and *Navicula lyra.*

They're particles of CELITE

that produce a porous, free-filtering cake, giving longer filtration cycles and brilliantly clear syrups.

Celite's unique diatomite structure is shown in this photomicrograph. The infinite variety of particle shapes and sizes gives Celite its exceptional performance characteristics as a filter-aid in the Cane and Beet Sugar Industries.

JOHNS-MANVILLE JM PRODUCTS

For further information about Celite, simply write Johns-Manville International Corp., Box 60, New York 16, N.Y., U.S.A. *For England and Continental Europe:* Johns-Manville Co. Ltd., 20 Albert Embankment, London, S.E.11.

THRO' THE MILL—ON PENNINE CHAIN

Running on wheels

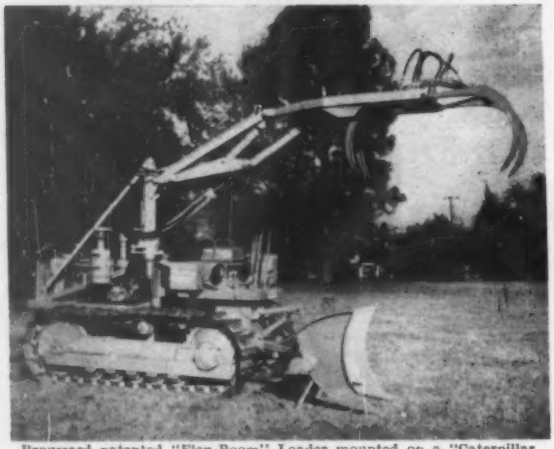
The wearing life of malleable iron chains is greatly influenced by the type of sprockets used in the drive. Pennine cast sprocket wheels are balanced in design to ensure smooth running and longer chain service. Accurately pitched sprocket teeth are ground to fit each chain correctly. Precision-bored hubs with true keyways facilitate easy fitting.

In addition to the three standard patterns—arm wheel, solid and split centre sprockets—other patterns can be furnished to suit specific needs.

Pennine wheels

Catalogues on request: PENNINE CHAINBELT CO. LTD., ARMLEY, LEEDS 12, ENGLAND

SUGAR CANE LOADERS



Broussard patented "Flex-Boom" Loader mounted on a "Caterpillar D-4 crawler tractor, with push plier, for Puerto Rico.

Capacity 2000 lb/minute (Under Louisiana conditions), grab capacity (54 in. opening) 1500 lb., load clearance 12 ft., loading radius 10 ft. to 12 ft., boom swing, front to right, 160°.
The Broussard heavy duty tropical type loader is also available for installation on the Track-Marshall, International TD-9, Allis-Chalmers HD-6, John Deere 440 crawler, Fordson-Major and International B 450 as well as various USA wheel tractors.
Extremely simple in design with few wearing parts and with perfect operator visibility on both wheel and crawler tractor installations, the Broussard Loader may be easily installed at the destination on tractors already in hand and quickly removed at the close of the harvest.

Manufactured by
BROUSSARD MACHINE COMPANY
ST. MARTINVILLE, LOUISIANA

Export Division
LOGAN PERKINS—SUGAR MACHINERY
International Trade Mart, New Orleans, U.S.A.

MEASURE

MACERATION WATER

by

LEA RECORDER

The only efficient way to measure Maceration Water is to measure it *continuously* and to have permanent records of the rate of flow. The most efficient instrument for this purpose is the Lea Recorder, large numbers of which are providing valuable information in Sugar Factories all over the world.

ACCURATE TO WITHIN 1%

Write for literature to:

THE LEA RECORDER Co. Ltd.
Cornbrook Park Road,
MANCHESTER, 15, England.

and defeco-saturated to an alkalinity of 0·05–0·06% CaO. It is sent to a clarifier, the muds from which pass to a rotary vacuum filter yielding a filtrate which is mixed with the clarifier overflow, heated to 95–98°C, limed to 1–1·4% CaO and mixed with 150–200% unfiltered juice before carbonatation to 0·08–0·1% CaO alkalinity. After passing through a second clarifier, the juice goes to 2nd carbonatation while the muds are returned to the raw juice. Factory tests show that the 1st carbonatation juice has a settling rate 4 times greater than that of juice treated by the usual process, and the 2nd carbonatation juice has a purity 1·65 units higher on average. Lime salts content of the 2nd carbonatation juice is 58% lower and the colour 42% lower.

* * *

A minimum time for technological processes. L. E. FLEISHMAN. *Sakhar. Prom.*, 1960, (7), 21–23.—The length of time required in the individual processes in the sugar factory is increased by enlarging the overall dimensions of the equipment, these being often unnecessarily greater than the effective size. Data are reproduced to show the difference between Claassen's values and the norms laid down by the Central Institute of the Sugar Industry for the time for juice processing stages up to the vacuum pans, total times being 3 hr 12 min (Claassen) and 5 hr 57 min (Institute). Measures suggested to overcome this include the use of polyelectrolytes for clarification and adoption of the Fives-Lille juice thickener.

* * *

Method of determining the beet tare at reception. P. N. SHEMYAKIN. *Sakhar. Prom.*, 1960, (7), 25–27.—Experiments have shown that a sample of beet from every 5th truck is sufficient for beet tare determination and reduces the labour requirements.

* * *

Features of the screw conveyor system in a tower diffuser. M. S. GABOVICH and I. I. PRILUTSKII. *Sakhar. Prom.*, 1960, (7), 28–30.—Tests carried out on a single-column tower diffuser are described. A number of factors affecting the screw conveyor performance were investigated, including optimum cossette shape and length, the point at which pulp should be returned, and where the cossettes should be fed and the juice withdrawn. On the basis of the results, certain modifications are suggested.

* * *

Electromagnetic, ultrasonic and boiler processing of water. P. T. DUNAEV. *Sakhar. Prom.*, 1960, (7), 50–54.—The theories of electromagnetic and ultrasonic treatment of boiler feed water and their application are discussed. Water treatment within the boiler as a scale preventive measure is also considered.

Purification of flume waters in settling tanks. J. GEBLER. *Listy Cukr.*, 1960, **76**, 180–185.—A purification scheme for flume water is described. The water, from which leaves and tails are removed, is limed in a 37cu.m. tank, then passes to three 212-cu.m. settling tanks. The purified water is returned to process, and the muds are discharged to a 14,250 cu.m. drying basin to be used for agricultural purposes after the campaign. In the event of overloading, water overflows from the drying basin to a sand filter, from which it flows to the river. During 1959/60, 87% by volume of the insolubles were removed from the water and the mud took only 3 months to dry. Complete data are tabulated.

* * *

Calculation of the additional sugar yield with the use of ion exchange processes. H. HITZEL. *Zucker*, 1960, **13**, 431–435.—The non-sugars composition must be taken into consideration in refractometric dry solids determination; the importance of this is underlined when calculating the additional yield resulting from ion exchange processing, where refractometric values vary, with chemical changes in the non-sugars, according to the process used. Demineralization, the SCC process and the Quentin process are discussed in turn from the viewpoint of the correction factor to be used in conversion of refractometric to true Brix values. Calculations are given demonstrating the errors that can arise by ignoring the changes, and diagrams are presented showing the relationship between purity change and the apparent purity using different correction factors, and for determination of the molasses sugar yield (based on the Cecil formula) and additional sugar yield.

* * *

Mechanical limestone unloading at Letshin sugar factory. E. GLEICH. *Zuckererzeugung*, 1960, **4**, 245–246.—Limestone is unloaded automatically from rail trucks into a bunker and is then transported continuously to the sugar factory on an ore-carrying belt conveyor.

* * *

Waste waters—a danger to our rivers. W. SCHWARTZ. *Zuckererzeugung*, 1960, **4**, 246–The high fatality rate among fish is blamed on pollution or rivers by sugar factory effluent. The pH of waste waters should be kept to within 6–8·5 and samples of the water should be analyzed when dead fish are encountered.

* * *

Improvements in drum drying plant in the sugar industry. A. SCHWIETER. *Zeitsch. Zuckerind.*, 1960, **85**, 410–414.—Means of increasing the efficiency of drum dryers are discussed, including insulation and packing. Additional oil-heating and dust extraction are also considered. Based on a 10% drop in heat consumption brought about by a number of innovations, DM 3½ million could be saved in drying the beet pulp production of Germany.

LABORATORY METHODS AND CHEMICAL REPORTS

Determination of total fermentable substances and molasses payment. V. M. KATS and T. P. KHVALKOVSKII. *Sakhar. Prom.*, 1960, (7), 31–34.—Analysis by acid inversion of the sugars in molasses for shipment and payment by the distilleries is felt "to disturb the orderliness and harmony of the factory sucrose balance," calculated by direct polarization. The invert sugar is often not calculated although the apparent purity is lower than the true purity, and the raffinose content at a pol-sucrose difference of less than 0·5% is not calculated. Direct polarization should continue in use by the factory and should be adopted by the distillery.

* * *

Characterization of white sugars with permanganate. A. PASETTI. *Ind. Sacc. Ital.*, 1960, **53**, 95–98.—The literature on quality testing of white sugars is briefly reviewed, with 17 references. A new method is proposed in which 30 grams of the sugar are dissolved and made up to 100 cc with distilled water. After heating to 71–72°C, 0·5 cc of N/10 potassium permanganate solution is added, a stopwatch being started simultaneously. The time for the colour to change from rose-pink to yellow is recorded and is characteristic of the sugar quality since the impurities in white sugar are oxidised more rapidly than the sucrose itself. Thus, pure refined sugar takes 80 seconds to change colour while commercial sugar takes 30–70 seconds, good quality crystal sugar takes 25–30 seconds and poorer quality as little as 8–10 seconds.

* * *

Changes in the composition of sugars during storage of beet. M. Z. KHELEMSKII, E. A. VOROB'EVA and M. L. PEL'TS. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 3–18.—The properties of raffinose and kestose and the quantities in which they are present in beet, sugar and molasses are discussed with a description of the quantitative analytical methods used. Tests were carried out on beet to discover the changes in the quantity of the two dextrorotatory trisaccharides in factory products throughout the campaign. Chromatographic analysis of press juice showed that the kestose was present in smaller amounts than the raffinose in beet stored in the autumn, whereas in March the reverse was true, the raffinose content being 0·022% on weight of juice and 0·091% on total dry solids in the juice, and the corresponding kestose values being 0·034% and 0·141%. In October, February and March the combined raffinose + kestose content was 0·20%, 0·25% and 0·30% by weight respectively in syrup, and 2·29%, 2·425% and 3·26% respecively in molasses. The kestose content of molasses increased during storage at a greater rate (50% between January and March) than the raffinose (10%) giving an increase in the kestose:raffinose ratio from 1·44 to 2·0. The total content of the two sugars in the molasses was 1·5–2·0 times higher than that in the juice. It is suggested that the variance in the contents of the two sugars may be a result of different methods used in preparing the juice and molasses samples for chromatographic analysis, or may be caused by changes in the carbohydrate complex of beet during production. Special studies using a balance of the substances is recommended. Maximum increase in both sugars occurred in molasses during Spring and from combine-harvested beets. A graph demonstrates the relationship between the amount of the two sugars in factory products and the production period. Storage of beet in high piles with mechanical ventilation resulted in a drop in the trisaccharide content in the molasses during March. Generally there was 3 times as much in the molasses towards the end of the campaign than in November. There was 2·7 times as much kestose as raffinose in autumn molasses. The apparent purity of molasses was different from the true purity, owing to the presence of raffinose and kestose. This also applied to the double-enzyme method in the presence of kestose; the method is unsuitable for raffinose determination because of its low sensitivity. Beet with whole heads contain more trisaccharides than those with cut heads.

* * *

Determination of moisture in sugar industry products. G. S. BENIN and V. A. TSIRUL'. *Trudy Tsentr. Nauch.-Issled. Sakhar. Prom.*, 1960, **7**, 61–73.—Various rapid methods of moisture determination are described and recommendations offered on the basis of test results. For pulp, open distillation or the use of Chizhova's apparatus is recommended. The first is based on distillation of the moisture from the sample mixed with dehydrated paraffin or vegetable oil, and weighing of the residue. Chizhova's apparatus comprises two electrically-heated plates (the bottom one equipped with a contact thermometer) connected so that one may close down on the other, or may be kept a certain set distance apart. The instrument is connected to a heat regulator, and the sample in paper packets is placed between the plates. For refinery magma, the same apparatus is recommended, as is Fisher's iodometric method, based on titration of a solution of I_2, SO_2 and pyridine in MeOH. For white sugar with a moisture content of 0·05–0·15%, drying at 130°C during 15–17 min is recommended.

* * *

Application of the method of flame photometry for determination of the calcium and sodium content of sugar industry products. V. A. TSIRUL'. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 74–86.—A flame photometer assembled at TsINS is described in detail, the filters having a maxima of 5890 ±30 A for Na, 7680 ±30 A for K and 6200 ±30 A for Ca. Samples of molasses and beet ash and of liquid

molasses were tested for K and Na content, the cobaltinitrite method being used in the presence of silver ions for determination of K. Na was then determined from the total of K + Na by the barium method. Part of each sample was converted to carbonate ash and analysed chemically for K_2O, Na_2O and for C residue in the ash. The results were converted to the corresponding content in fluid molasses, and all compared satisfactorily with the flame photometric results. Where differences appeared the correct result was that given by the flame photometric method. Calibration curves are presented for determination of the K and Na concentrations.

* * *

Determination of glutamic acid content of final molasses. A. K. KARTASHOV, L. K. IVANOVA and N. A. MAKSIMOVA. *Trudy Tsentr. Nauch.-Issled Inst. Sakhar. Prom.*, 1960, **7**, 87–102.—The apparatus and techniques used in paper electrophoresis are described in detail. Two methods of quantitative analysis of the strips were used: direct photometry of the strips, and photometric analysis of an aqueous eluate of the glutamic acid obtained from the strips. It was found that the optical density of the eluate diminished after 40 min. The optical density was read off a calibration curve and the results calculated on the original molasses. The results were checked by adding a known amount of pure glutamic acid to molasses samples containing an average of 2·4 and 3·3% glutamic acid. Results are tabulated for a number of factories, using both methods, which gave practically identical results in most cases, but in some gave wide divergences where the glutamic acid content of the molasses was high. This was possibly due to the use of different filters for the two methods.

* * *

Determination of the true surface and equivalent thickness of beet cossettes. A. YA. ZAGORUL'KO. *Trudy Tsentr. Nauch.-Issled. Inst. Sakhar. Prom.*, 1960, **7**, 124–132.—Geometric determination of the surface of a cossette by measuring the cutting edge of a knife with subsequent elementary calculation of the groove of flat surface is unsuitable, as is measurement of the thickness by a gauge. Because of cracks and fissures in the cossette, the surface is greater and the thickness smaller than indicated. Methods are described (1) for calculating the equivalent thickness (that thickness of an unlimited lamella of beet tissue which has a resistance to diffusion equal to that of a cossette obtained from the same beet and under identical conditions) and (2) of determining the true surface (based on the theory of mechanical plasmolysis). For (1) an extractor was employed, consisting of a metal column with screens at the bottom and at the top of each wall. The cossette was placed in the column with cylindrical beet particles of 15–30 mm dia. and 2–5 mm thick, obtained from pre-treated beet; diffusion was carried out at 70°C, the counter-flow of fresh water being sufficient to keep the cossettes and particles afloat. After 5–10 min flow was stopped, the bottom screen and thus the cossette and particles pulled out by a handle attached to the screen, the beet dried and the sugar content determined by hot water digestion. Formulae are presented for calculation of the diffusion coefficient, and from this calculation of the equivalent thickness. The true surface was calculated from the % plasmolysed cells in the ideal cossette obtained with a microtome from an average beet. Worked examples are given.

* * *

Study of raffinose in raw sugars; presence of several fructoside-sucroses. M. M. CHOLLET and M. C. DESCAT. *Ind. Alim. Agric.*, 1960, **77**, 389–391.—Chromatographic analysis of raw sugar samples, using pyridine:*iso*-amyl alcohol:water and butanol: acetic acid:water as solvents and urea as colour reagent, revealed 5 polyoses in the neighbourhood of the raffinose and sucrose spots. These were identified by hydrolysis as a monofructosidosucrose, a difructosidosucrose, and tri-, tetra- and penta-fructosidosucroses. The first two, and probably the last three, are revealed only by urea. The significance of the presence of these levorotatory hydrolysable polyoses in the Clerget determination, which assumes that sucrose is the only hydrolysable sugar present, is discussed. Although the error involved would be very slight, the result would be very different from that given by the presence of raffinose, which is dextro-rotatory.

* * *

Colorimetric standards. I. The problem of colours. V. VALTER. *Listy Cukr.*, 1960, **76**, 162–165.—The principles of colorimetry as applied to the sugar industry, the sensation and the measurement of colour are discussed with 20 references to the literature. It is shown that for an unambiguous definition of colour sensation expressed as °St. it is not enough to determine merely the extinction coefficient at one wavelength or the total extinction coefficient in white light. A thorough determination of colour perception is possible by establishing colorimetric co-ordinates based on one of the trichromatic systems. The C.I.E. (International Commission of Illumination) trichromatic system of 1931 is very suitable for this purpose, and is to be discussed later[1].

* * *

Preparation and storage of beet samples for sucrose analysis. A. ULRICH and K. OHKI. *J. Amer. Soc. Sugar Beet Tech.*, 1960, **11**, 68–74.—Samples of fresh beet pulp (26 g) were sealed in small polyethylene bags of 0·0015 inches wall thickness, frozen immediately with dry ice, and stored at —2°F for 3½–32 months. The pulp was digested with basic lead acetate during 30 min on a hot water bath at 80°C; after cooling to 20–23°C and filtering, the sucrose in the filtrate was determined in a saccharimeter. The final and inital sucrose contents for 5 stages during the storage period are tabulated for 25

[1] *I.S.J.*, 1960, **62**, 360.

samples and are relatively constant, differing little from the analysis at the start of storage. Mechanical mixing of the pulp before sampling and vigorous stirring of the slurry before filtration are recommended as additional steps.

* * *

Determination of moisture in sugars by drying methods. T. NAGAHARA and C. TSUTSUMI. *Rpt. Food Res. Inst., Tokyo*, 1958, **13**, 83–84; through *S.I.A.*, 1960, **22**, Abs. 460.—The two methods of drying recommended by the 11th Session of I.C.U.M.S.A.[1] were tested on granulated, soft white, yellow soft, and raw sugars; drying at 130°C was also examined. The results are compared in a table. Drying at 103°C for 3 hr gave higher results than by the vacuum oven method; drying for long periods, especially at 130°C gave high values with some decomposition; and drying for 15 min at 130°C in the air oven gave slightly higher results than those obtained by the vacuum oven method, but because of good reproducibility is likely to be satisfactory as a routine method. (*Cf. Proc. 11th Session ICUMSA*, 1958.)

* * *

Determination of total reducing sugars in molasses by the modified Blom (& Rosted) method employing two solutions. Y. MATSUO and A. NANBA. *J. Fermentation Technol.*, 1960, **38**, 1–4; through *S.I.A.*, 1960, **22**, Abs. 465.—The total reducing sugar value obtained by the Blom & Rosted method[2] is more accurate than that obtained by the Hemmi modification of the Bertrand method[3], especially as the former method is not influenced by admixtures. When the acid hydrolysis of cane molasses is carried out with 0·1% of HCl at 100°C for 39 min, the result is accurate, but with 1% of HCl the result is inaccurate. No difference was detected between the two levels of acid when beet molasses was hydrolyzed.

* * *

The reaction of sucrose with glycol-cleaving oxidants. A. K. MITRA and A. S. PERLIN. *Canad. J. Chem.*, 1959, **37**, 2047–2052; through *S.I.A.*, 1960, **22**, Abs. 488.—Lead tetra-acetate in acetic acid is vigorously reduced by sucrose, whereas the reaction between sucrose and sodium periodate is less vigorous. The former reaction is related to the preferential cleavage of the 3,4-glycol group in the D-fructofuranosyl moiety of the sucrose molecule, and the periodate attacks the D-glucopyranosyl group more readily. These variations in the vigour of the reaction also occur in the same solvent and therefore appear to be related to the characteristics of the oxidants themselves. The mechanism of the action of lead tetraacetate is discussed with reference to the stereochemistry of the D-fructofuranose unit. Selective oxidation provides a chemical method for controlled degradation of the sucrose molecule and affords products in which either the D-fructose or the D-glucose residue is modified.

Present status of colour determination in refineries. P. HONIG. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The determination of the colour of raw melts, liquors and sugars is discussed, especially the reasons for not adopting generally the recommendations of ICUMSA. The necessity of introducing more objectivity and standardization in reports of colour data and the present difficulties regarding nomenclature and systems of calculations are also considered. The histories of the Stammer colour units and of the Horne scale are reviewed, as are their inter-relationship. Means of eliminating differences in Horne standards from different sources are suggested.

* * *

Density of refined sugar in bins and silos. G. H. BALDT and E. F. COMPTON. *Paper presented to the 19th Ann. Meeting, Sugar Industry Technicians Inc.*, 1960.—The effects on bulk density of refined sugar stored in bulk bins and silos of product charging velocity, vibration and static pressure are discussed, and experimental results correlated with actual calibration tests conducted on refined sugar bins and silos.

* * *

Studies on the relationship between the supersaturation coefficient, viscosity and electrical conductivity of sugar solutions[4]. W. S. GRAHAM. *S. African Sugar J.*, 1960, **44**, 586–590.—The viscosity and conductance of sucrose solutions containing 3 and 6% KCl were determined at 46 and 55°C at supersaturation coefficients from 0·90 to 1·25. Results are tabulated and graphs are presented of viscosity and resistivity *vs.* supersaturation coefficient and *vs.* sucrose: water ratio. It was found that the effects of temperature on supersaturation coefficient, resistivity and viscosity were similar so that it should not be necessary to take special precautions to control temperature where determining the supersaturation coefficient from either resistivity or viscosity. The ratio of supersaturation coefficient:resistivity was sensitive to changes in the electrolyte concentration unlike the viscosity:supersaturation coefficient ratio.

* * *

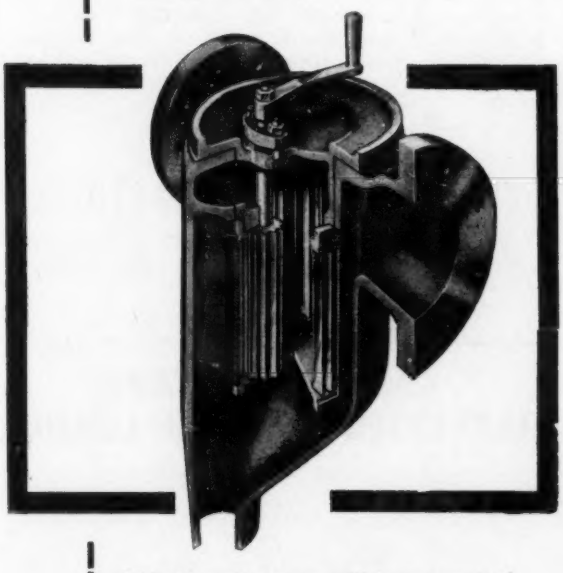
Colorimetric standards. II. The CIE (Commission Internationale de l'Eclairage) trichromatic system. V. VALTER. *Listy Cukr.*, 1960, **76**, 176–180.—The XYZ system is described theoretically. While it would be advantageous in the sugar factory and would enable differentiation between the colour bodies of raw sugar and refined sugar, its main disadvantage lies in the length of time required to evaluate the results of the calculations, even if these were simplified. Instruments equipped with three suitable filters, for direct determination of the values of X, Y and Z, are only now being introduced into special laboratories. The results achieved in determination of sugar standards are to be given later.

[1] *I.S.J.*, 1955, **57**, 331–2.
[2] *See I.S.J.*, 1949, **51**, 133; 1954, **56**, 204.
[3] See *J. Agric. Chem. Soc., Japan*, 1943, **19**, 381–395; 1946, **21**, 5; *Chem. Abstr.*, 1951, 10141.
[4] *See also* JENKINS: *I.S.J.*, 1959, **61**, 335.

THE

ROTOKLENE

SELF-CLEANING STRAINER FOR ALL SUGAR LIQUORS



With the ROTOKLENE self-cleaning strainer liquors can be efficiently strained to fine limits. A simple, unique and reliable cleaning mechanism allows the strainer to be cleaned without interruption of flow by a few turns of a handle. Where constant cleaning is necessary, the strainer can be belt or motor driven. There are few moving parts, all robustly constructed to ensure long life.

Write for an explanatory booklet and details of installations where ROTOKLENE strainers are being used with outstanding success for straining clarified cane juice and similar applications in the Sugar Industry

ASHWORTH & PARKER LTD

RIVERSIDE WORKS · BURY · LANCS

INTERNATIONAL

- **Sugar Consultants**
- **Agricultural Property Management**
- **Agricultural Development**

SPECIALIZING IN THE DESIGN, CONSTRUCTION AND OPERATION OF SUGAR INDUSTRIES

AFFILIATED COMPANIES
AMERICAN FACTORS, LTD.
KEKAHA SUGAR CO., LTD.
OAHU SUGAR CO., LTD.
PIONEER MILL CO., LTD.
PUNA SUGAR CO., LTD.
THE LIHUE PLANTATION CO., LTD.
WAIMEA SUGAR CO., LTD.

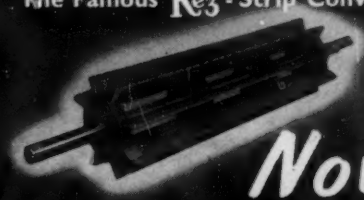
Brochure available on request.

AMERICAN FACTORS
Associates, Limited

745 Fort Street, Honolulu 1, Hawaii

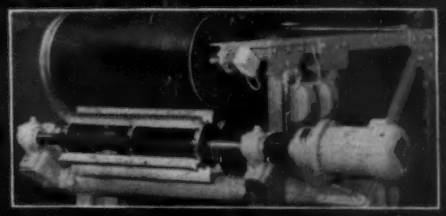
Member : **SUGAR INTERNATIONAL**

The Famous Kez - Strip Conveyor Belt Brush



Now -

complete in combination with our K·A·M UNIT



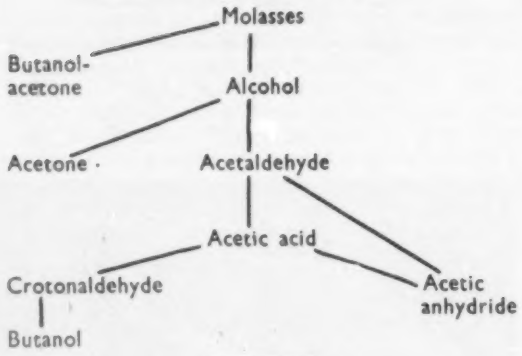
Showing unit in position ready for action. Micro-adjustable. Flameproof. Anti-static features can be incorporated. Little, if any, guarding required.

INDUSTRIAL DIVISION
THE Kleen-e-ze BRUSH CO. LTD

83 BEVAN LANE, HANHAM, BRISTOL

IMPROVED DISTILLATION EQUIPMENT

FERMENTATION AND BYPRODUCTS INDUSTRIES



Ancillary industries :
Yeast and glucose manufacture

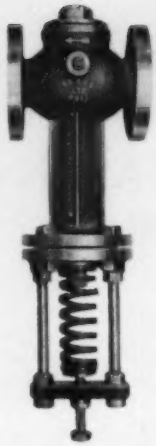
Planning
Projects and Engineering
Construction
Erection
Initial operation

SPEICHIM

Société pour l'Equipement des Industries Chimiques

14 rue la Boétie

PARIS 8 ème — FRANCE



REDUCING VALVES

in
GUNMETAL
CAST IRON or
STEEL

Available for
Steam, Water, Air
or Gas

Sizes ¼ in. upwards

G. & A. E. SLINGSBY LTD.

Phone 20601 (5 lines) — **CLEVELAND STREET HULL** — *Phone* 20601 (5 lines)

CARY SUGAR CANE HARVESTER—CLEANER—LOADER

The Cary combination Harvester-Cleaner-Loader harvesting extremely recumbent 70 ton per acre cane and loading short lengths (15 in. or 22 in. lengths) into special side dump trailers. Capacity under Florida conditions 250-300 tons per day (cut, cleaned and loaded).

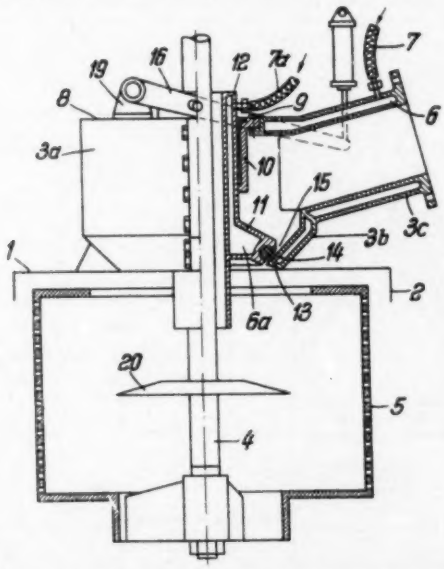
Manufactured by
CARY IRON WORKS
OPELOUSAS, LOUISIANA
(Also manufacturers of 3 to 12 ton Carts and Trailers and 4 to 8 ton Field Derricks and Hoists)

Export Division
LOGAN PERKINS—SUGAR MACHINERY
International Trade Mart, New Orleans, U.S.A.

TRADE NOTICES

UNITED KINGDOM

Feeding devices for sugar centrifugals. BRAUNSCHWEIGISCHE MASCHINENBAUANSTALT, of Braunschweig, Germany. **847,178.** 17th July 1958; 7th September 1960.—The cover 1 of the centrifugal outer jacket 2 carries a ring valve casing which is in two halves 3a, 3b immediately surrounding the drive shaft 4 of the basket 5. On the side 3b is provided a massecuite feed port 3c which has surrounding passages 6 supplied with hot water through pipe 7. A flanged stuffing box 10 is held by bolts 9 to the top 8 of the



ring valve casing, and permits the vertical movement of shaft 12, also hot-water-jacketed, without leakage. The cone 11 at the bottom of shaft 12 corresponds to the surface 14 at the bottom of the ring valve, a seal being provided by means of the ring 13. Movement of shaft 12 is effected by pivoting of arms 16 about the fulcrum 19, the arms being connected to the shaft by horizontal pins. As the shaft and so cone 11 move upwards, massecuite falls through the gap 15 and into the basket striking the rotating distributor plate 20 and being evenly spread on the wall of the basket.

* * *

Refining of sugar cane wax. R. S. DUBEY and WALCHANDNAGAR INDUSTRIES LTD., of Walchandnagar, Poona, Bombay, India. **848,135.** 3rd April 1958; 14th September 1960.—Sugar cane wax, alone or in solution, is subjected (at or above the melting point) to the action of chlorine gas in the presence of water (at least 1 mol of water per mol of chlorine used). The mixture is agitated during and after the reaction whereby the wax is obtained in a granular form when it cools.

* * *

Beet harvesters. C. VAN DER LELY N.V., of Maasland, Holland. **848,938**; **848,939.** 6th November 1956; 21st September 1960.

* * *

Production of levan sucrase. FARBENFABRIKEN BAYER AG., of Leverkusen-Bayerwerk, Germany. **850,552.** 1st May 1958; 5th October 1960.—To cultures of a levan-producing strain of *B. subtilis* in a solution of corn steep liquor which has been previously heated to 100–120°C at pH 7 and filtered, are added ammonium salts to the equivalent of 0·03–2% ammonium sulphate, 2–15% (about 10%) of sucrose and 0·005%–0·05% of phosphates. The cultures are fermented with intensive aeration (and agitation) at pH 6–7 and at about 30°C for 7–15 hr.

* * *

Beet thinner. NATIONAL RESEARCH DEVELOPMENT COUNCIL, of London W.1. **850,787.** 1st July 1959; 5th October 1960. * * *

UNITED STATES

Producing *allo-iso*-citric acid by fermentation. K. SAKAGUCHI, S. ABE and T. BEPPU, assrs. KYOWA HAKKO KOGYO K.K., of Tokyo, Japan. **2,949,404.** 1st July 1958; 16th August 1960.—*Allo-iso*-citric acid is produced by cultivating *Penicillium purpurogenum* Stoll var. *rubi-sclerotium* Thom, *P. sclerotium* van Beyma, *P. expansum* (Link) Thom, *P. verraculosum* Peyronel or *P. aculeatum* Raper and Fennell under aerobic conditions (at 20–35°C) in a nutrient medium containing carbohydrate material (sucrose), inorganic salts and a nitrogen source (peptone, urea, ammonium sulphate, ammonium chloride, sodium nitrate or ammonium nitrate) at a pH of 5–7·5 (maintained by the presence of calcium carbonate). The broth is filtered and a water-miscible solvent (methyl or ethyl alcohol, methyl ethyl ketone or dioxan) is added to precipitate the acid salt of *allo-iso*-citric acid which is recovered.

* * *

Cane harvester with cutting apparatus. J. E. DOUGLAS and J. WOOD, of Melbourne, Victoria, Australia, assrs. MASSEY-FERGUSON (AUSTRALIA) LTD. **2,953,886.** 11th September 1957; 27th September 1960.

Copies of Specifications of United Kingdom Patents can be obtained on application to H.M. Patent Office, 25 Southampton Buildings, London, W.C.2. (price 3s. 6d. each). United States patent specifications are obtainable from: The Commissioner of Patents, Washington, D.C. (price 25 cents each).

TRADE NOTICES

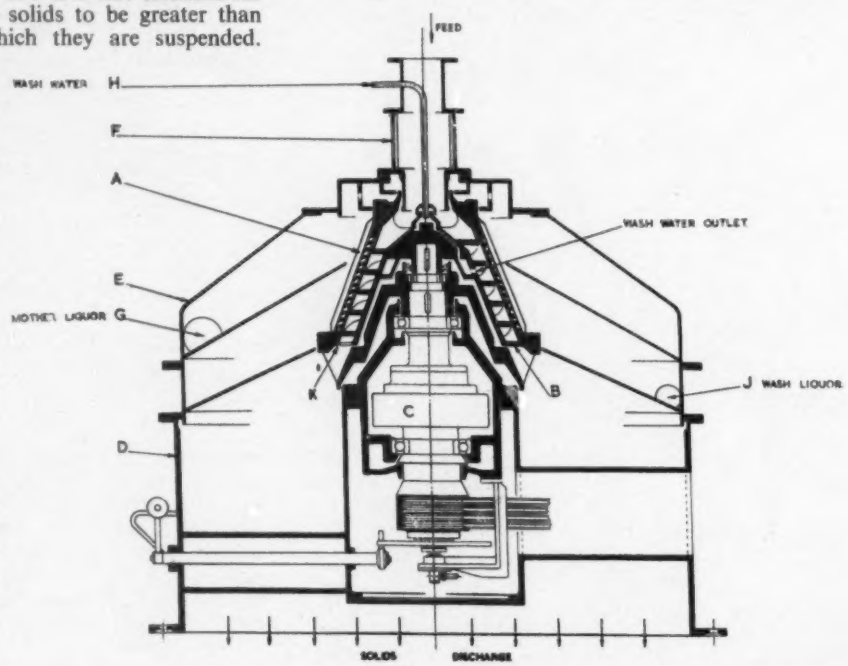
Statements published under this heading are based on information supplied by the firm or individual concerned. Literature can generally be obtained on request from the address given.

The "Dynoscreen" continuous screen type centrifuge. International Combustion Ltd., 19 Woburn Place, London, W.C.1.

The recently introduced "Dynoscreen" continuous screen type centrifuge is a compact unit of established design for the separation of solids from magmas and slurries, including sugar.

The "Dynoscreen" can function either as a centrifuge or centrifugal screen, handling a wide variety of materials. Fibrous and granular solids as well as powdery materials possessing free draining characteristics are easily separated, and it is not essential for the specific gravity of the solids to be greater than that of the liquor in which they are suspended. When used to separate crystals from magma, the Dynoscreen will deliver a product of uniform dryness into a dryer at a continuous rate.

Low power requirements, simplicity of operation, ease of installation and maintenance, and its thorough reliability are all features that recommend it for use wherever high duty performances are needed at minimum cost.



KEY: (A) Revolving perforated cone. (B) Helical screw conveyor. (C) Gear unit. (D) Mild steel base. (E) Stainless steel or mild steel hood. (F) Sight glass. (G) Effluent outlet. (H) Wash water inlet. (J) Wash water outlet. (K) Screen mesh.

* * *

"Rodene" process timers. D. Robinson & Co. Ltd., Gunnersbury House, 717 London Rd., Hounslow, Middlesex.

The latest range of "Rodene" process timers are of interest because of their great versatility. The "25" series of timers, for instance, consists of units for single-stage operation giving times of from one second up to ten minutes. They reset automatically and thus the dial need only be turned for a new setting. Repetitive timing can be controlled remotely or automatically. This series is powered by a special motor which always reaches synchronous speed in the right direction in a fraction of a second and automatically declutches when switched off. All units are fully tropicalized and are available for board, through panel or flush mounting. They have a variety of applications such as for the mixing of substances for an exact period of time.

The "7000" timer is a robust instrument which provides a range of times from 20 seconds to 3 hours or more and can thus be used when longer time cycles are required. It is also fully tropicalized and its dial has a shatter-proof window. Setting is effected by means of a red pointer worked by a knob which is geared down to 3:1 for setting accuracy. A black pointer travels towards zero showing the unelapsed time and leaving the red pointer marking the set time. On resetting, the black pointer returns instantly without bounce to cover the red pointer.

For sequential control of processes a series of "Rodene" multi-circuit cam timers has been developed, the smallest having a range of 1 to 15 seconds and up to four cams and the largest having a time cycle of one week and up to 24 cams. Most of the units in this series are available with a shunt wound D.C. motor as an alternative to the synchronous A.C. motor. They are supplied in a sheet metal cover but are also available with dustproof, weatherproof and flameproof covers. Pilot lights, contactors and other subsidiary components can be fitted.

"Rodene" process timers are manufactured with standard motor windings for operation on any voltage up to 450 and at frequencies from 40 to 60 c.p.s.

VENEZUELA SUGAR STATISTICS, 1954-59[1]

(METRIC TONS—RAW VALUE)

Calendar Year:	*Production*	*Exports*	*Imports*	*Net Exports*	*Net Imports*	*Consumption*
1954	101,814	—	17,660	—	—	130,000
1955	156,589	0	1,684	0	1,684	135,000
1956	215,855	34,081	262	33,819	0	140,000
1957	209,533	114,438	0	114,438	0	145,000
1958	170,280	15,128	6,117	9,011	0	150,000*
1959	190,070	6	61,434	0	61,428	178,000*

[1] *I.S.C. Stat. Bull.*, 1960, **19**, (10), 93. * *Provisional*

BREVITIES

Bagasse paper mill for India[2].—A paper mill for the production of 60,000 tons of newsprint per year will be erected at Karad in Maharashtra State in India, about 220 miles from Bombay. The estimated cost is $20 million, and the plant will operate on processes patented by Hawaiian Development Company and Crown Zellerbach Corporation. Rohtas Industries will build and operate the new plant.

* * *

Pneumatic harvesting of sugar beet[3].—In East Germany an idea has been formulated for harvesting sugar beet pneumatically. Two rigid metal feelers lift the beet tops upright and a share lifts the plants to another feeder which guides the tops of the beet into the opening of a vertical metal duct, up which they are drawn by the suction produced from a powerful p.t.o.-driven fan. The inner surface of the duct has rounded protruberances, against which the beet strike on their way up, knocking off any dirt still adhering. The beet sucked to the topping unit, consisting of thin taut wires which cut off the tips. Beet and tops then pass on to separate hoppers.

* * *

Argentina sugar production restrictions eased[4].—Some measure of relaxation has been announced in the provisions imposed on the sugar producing industry in Argentina, according to a Press agency report. It has now been decided that mills may manufacture sugar in excess of the quotas which had been assigned to them provided permission is received in all cases from the Secretary of Commerce and any additional tonnage manufactured is earmarked exclusively for export and is, in fact, exported by the 30th June 1961. Furthermore, mills must draw up separate accounts in respect of exports and domestic sales. If Argentina were to be awarded a quota or non-quota entitlement by the U.S.A. next year this easing of restrictions might prove of great value to exporters. Whether arrangements will be made to increase production before it is known if sales will be permitted to the United States, however, remains to be seen.

* * *

Beet storage mechanization[5].—Mechanical beet storage equipment, designed to complement modern sugar factory plant, is produced by a Czechoslovakian factory. The beet is unloaded and stored by the "semi-wet" method in which beets are removed from rail cars, trucks and trailers by water jet and then carried by way of a leaf catcher to an elevator where water and fragments of beet smaller than 10 mm are separated. The cleaned beet and tails bigger than 10 mm pass by way of a separation grating to the main conveyor between the channels. The tails separated by the grating are delivered to the separating flume and are either loaded onto a truck or added to the beet for processing. The beet is removed from the store yard by means of water jets and carried by flume to the washers. The equipment has a capacity of 200 tons of beet per hour and requires three operators during the day and two at night. For bigger factories equipment of up to 360 tons per hour can be provided. Advantages include low cost as well as minimum damage to the beets with consequent reduction of losses.

Frontispiece.—Our frontispiece this year features the Big Bend factory of Swaziland Sugar Milling Co. Ltd., the photograph being taken early in November just after the factory came into operation. Equipment was supplied by A. & W. Smith & Co. Ltd.

* * *

The late Dr. Hans Mosolff.—We regret to record the death at the age of 56 of Dr. H. Mosolff, Head of the Sugar Market Research Dept. at Bonn and Dozent at Berlin Free University and Technical University. Dr. Mosolff was well-known as an author of numerous publications on sugar economics, including the Zuckerwirtschaftliches Taschenbuch.

* * *

International Society of Sugar Cane Technologists.—The Proceedings of the 10th Congress were reviewed in our issue of September this year[6]. We have now been advised that distributors for the British Commonwealth are D. van Nostrand & Co. Ltd., of 358 Kensington High Street, London W.14, and that the sterling price is £8. 10s.

* * *

U.S. beet acreage controls lifted for 1961.[7]—The U.S. Dept. of Agriculture announced on the 18th October that there would be no sugar beet acreage restriction during 1961. In 1960 the acreage has been restricted to 1,000,000 acres and this is likely to be increased to 1,100,000 acres planted to beets in 1961 and a yield of 2,600,000 to 2,700,000 tons compared to the 2,400,000 – 2,450,000 tons in the current campaign.

* * *

Barbados harbour nears completion.[8]—The last of the 15-ton concrete blocks in the breakwater of the new deep-water harbour at Bridgetown, Barbados, was set in October 1959 and the superstructure is now almost complete. A minimum dredged depth of 32 ft is provided in the 40 acres of sheltered harbour formed by the breakwater arms and the quay wall. A berth for coastal steamers and schooners is due for completion in January while ocean-going vessels will be using the new harbour in early 1961. The bulk sugar store under erection on the site will hold 80,000 tons of sugar. Mechanical conveyor equipment is being supplied by Spencer (Melksham) Ltd. and will be able to receive sugar from the factories at a rate of 150 tons per hour, while the ship-loading equipment will be of 500 tons/hour capacity. Sugar being received from the factories can pass direct to the ship-loading system at the same time as sugar is being withdrawn from store. It is expected that the work will be almost entirely completed by the end of March 1961.

[2] *Sugar y Azúcar*, 1960, **55**, (11), 55.
[3] *World Crops*, through *Travers' Circular*, 1960, (67), 183.
[4] C. Czarnikow Ltd., *Sugar Review*, 1960, (482), 193.
[5] *Czech Heavy Industry*, November 1960, 33.
[6] *I.S.J.*, 1960, **62**, 259.
[7] *Lamborn*, 1960, **38**, 209.
[8] *W. India Comm. Chronicle*, 1960, **75**, 259–260.

Japan Sugar Imports[1]

Calendar years 1957–1959

Source	1959	1958	1957
	(Metric tons, raw value)		
Australia	110,336	145,318	111,169
Brazil	94,784	69,844	1
Cuba	388,601	517,568	511,223
Denmark	3	0	0
Dominican Republic	61,526	70,663	37,255
Ecuador	15,552	19,611	0
Fiji	5,038	0	0
France	0	0	1
Haiti	0	44	5,077
Indonesia	0	0	38,458
Mauritius	0	14,370	10,245
Nicaragua	12,218	0	0
Norway	0	1	0
Papua	1,000	0	0
Peru	98,460	33,169	98,733
Philippines	19,188	400	0
Taiwan	353,813	297,286	301,311
United Kingdom	63	43	0
United States	15	28	257
Other countries	0	1,512	3,419
Total	1,160,597	1,169,957	1,117,149

[1] *Lamborn*, 1960, **38**, 203.

Stock Exchange Quotations

CLOSING MIDDLE

London Stocks (*at 17th November*, 1960)	
Anglo-Ceylon (5s)	14/9
Antigua Sugar Factory (£1)	13/9
Booker Bros. (10s)	30/6
British Sugar Corp. Ltd. (£1)	25/–
Caroni Ord. (2s)	4/1½
Caroni 6% Cum. Pref. (£1)	17/6
Distillers Co. Ltd. (10s units)	42/10½
Gledhow Chaka's Kraal (£1)	40/–
Hulett & Sons (£1)	51/–
Jamaica Sugar Estates Ltd. (5s units)	4/9
Leach's Argentine (10s units)	26/–
Reynolds Bros. (£1)	41/3
St. Kitts (London) Ltd. (£1)	19/–
Ste. Madeleine (Ord.) (£1)	27/6
Sena Sugar Estates Ltd. (10s)	14/3
Tate & Lyle Ltd. (£1)	51/3
Tate & Lyle Investments Ltd. (5s)	10/4½
Trinidad Sugar (5s stock units)	38/6
United Molasses (10s stock units)	33/10½
West Indies Sugar Co. Ltd. (£1)	19/6

CLOSING MIDDLE

New York Stocks (*at 16th November*, 1960)	$
American Crystal ($10)	43
Amer. Sugar Ref. Co. ($100)	28⅜
Central Aguirre ($5)	23¾
Cuban American ($10)	14⅜
Great Western Sugar Co.	29⅛
South P.R. Sugar Co.	16½
United Fruit Co.	15⅝

BREVITIES

Finland-U.S.S.R. trade agreement.[2]—Under the terms of a trade agreement signed recently in Helsinki, Finland will import 100,000 tons of Russian white sugar during 1961.

* * *

New refinery for Canada.[3]—A new sugar refinery, to be financed by a large Swiss group, is to be erected in the Province of Manitoba.

* * *

Bagasse paper in Venezuela.[4]—The Export-Import Bank has granted a credit of $1·5 million to C. A. Venezolana de Pulpa y Papel (Venepal) to finance the construction of a pulp and paper plant in Caracas. The plant uses bagasse for its pulp and produces paper for sacks, linerboard and corrugated paper.

* * *

New Mexican sugar factory[5].—The contract for the new Mexican sugar factory[6] has been awarded to Gutehoffnungshütte Sterkrade A.G. It is to be built at Ciudad Valles in San Luis Potosí and will have an annexed refinery. Daily crushing capacity will be 5000 tons of cane and it will go into operation in 1962/63.

* * *

Bagasse paper in Guatemala.[7]—Central America's first paper mill, the $2·5 million plant set up by Industria Papelera Centroamericana S.A. at Los Cerritos, Escuintla, has recently gone into production. It has a daily capacity of 40–50 short tons of kraft, bond and tissue papers in all sizes and grades. At present 25% of the raw materials are produced locally. By December 1960, when bagasse will also be used, the proportion of local raw materials will rise to 50%.

* * *

Cane research in Cuba.[8]—A Sugar Cane Agricultural Research Board has been set up by the Cuban Government in association with the Mill Owners' Association, Cane Growers' Association and the Federation of Sugar Workers. It has improved the Experiment Station at Jovellanos, set up a quarantine and special acclimatization station, imported 200 cane varieties from the world cane variety bank at Beltsville, Maryland, U.S.A., set up a special crossing and seed producing station in Havana Province, taken over formerly privately-owned experiment stations, installed facilities for intensifying the work of obtaining and releasing the native borer parasite *Lixophaga*, and started the training of specialised technicians. The Government intends to pay increasing attention to the improvement of commercial varieties and cultural practices.

* * *

Chinese sugar industry[9].—According to latest reports, the 1957 target of 2·4 million tons will not be reached until 1962. China has imported sugar factory equipment from East Germany, Poland and Czechoslovakia, using it as a design for the Chinese machinery manufacturers. In addition to large factories many small plants producing a type of gur in the form of strips have been set up. This strip sugar is very popular in China and is also exported to Burma. Average sugar production of recent years has been 1·2–1·4 million tons of which about 80% has been cane sugar and the remainder beet sugar. About 40% of the cane sugar was in the form of gur. Difficulty has been found in teaching primitive farmers in North and North East China modern methods of beet cultivation, although the problem has not arisen in the sugar cane areas where good yields have been obtained.

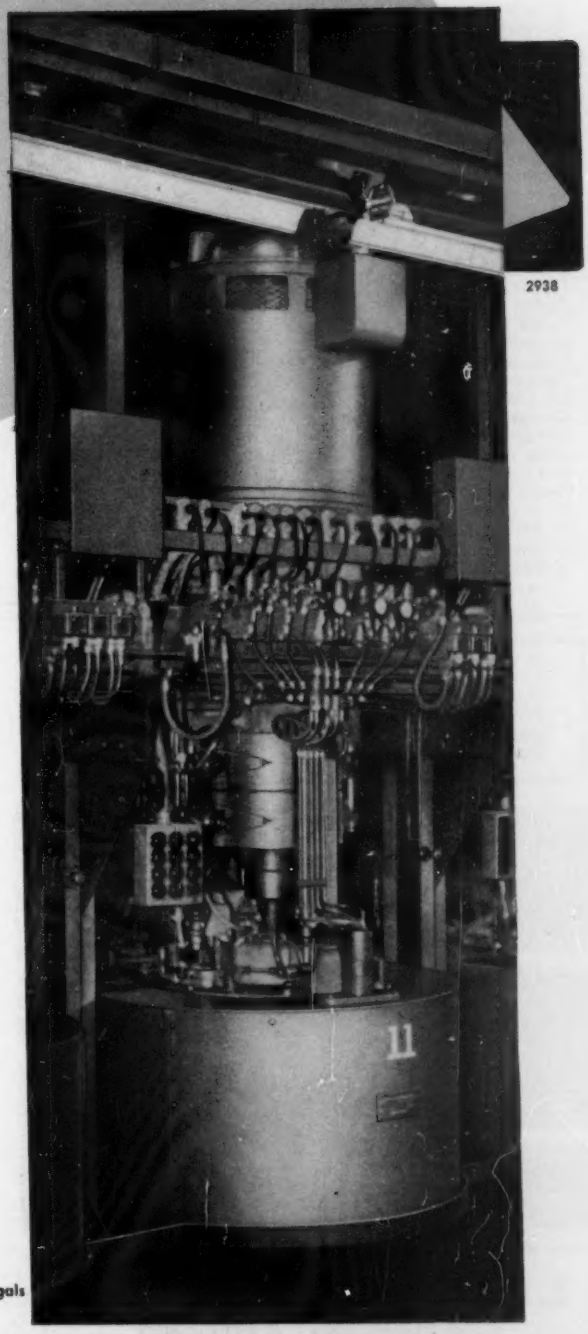
[2] F. O. LICHT, *International Sugar Report*, 1960, **92**, (10), 98.
[3] *Zeitsch. Zuckerind.*, 1960, **85**, 552.
[4] *Foreign Trade*, 1960, **114**, (8), 13.
[5] F. O. LICHT, *International Sugar Report*, 1960, **92**, (Supp. 20), 253.
[6] *I.S.J.*, 1960, **62**, 349.
[7] *Foreign Trade*, 1960, 114, (8), 13.
[8] *S. African Sugar J.*, 1960, **44**, 847.
[9] F. O. LICHT, *International Sugar Report*, 1960, **92**, (Supp. 20), 247.

Progressive El Potrero

buys

"WESTERN STATES"

for the Eighth Time



El Potrero, one of Mexico's largest and most progressive sugar producers, is quick to apply each new advance in sugar technology. During the past fifteen years they have purchased 35 Roberts Centrifugals. The latest installation consists of 15 machines. All are 100% automatic and incorporate the latest results of Western States experience and engineering.

Western States equipment is the profitable, physical result of Western States thinking.

One of fifteen Roberts G-8 completely automatic centrifugals installed at Ingenio El Potrero, Veracruz, Mexico.

THE WESTERN STATES MACHINE COMPANY

HAMILTON, OHIO, U.S.A. **TO KEEP THE LEAD . . . WE THINK AHEAD.**

Index to Advertisers

	PAGE
American Factors Associates Ltd.	liii
Ashworth & Parker Ltd.	liii
Blairs Ltd.	xxxv, xlvi
Officine Meccaniche e Fonderie A. Bosco	x
Braunschweigische Maschinenbauanstalt	xxxix
Thomas Broadbent & Sons Ltd.	i
Broussard Machine Company	lii
Buckau R. Wolf A.G.	xiii
Buell Ltd.	lxi
Buttner-Werke A.G.	xlviii
Cary Iron Works	liv
George Clark & Son (Hull) Ltd.	vi
Clydesdale Chemical Co. Ltd.	lix
Cochran & Co. Annan, Ltd.	l
Cocksedge & Co. Ltd.	xlv
George Cohen, Sons & Co. Ltd.	lix
A. F. Craig & Co. Ltd.	xxxiv
Crofts (Engineers) Ltd.	xl
A/S De danske Sukkerfabrikker	xxx
Dorr-Oliver Inc.	Inside Back Cover
Electromagnets Ltd.	ii
Escher Wyss Ltd.	vii
Ewart Chainbelt Co. Ltd.	lvi
Farrel-Birmingham Co. Inc.	xxv
Ferguson Perforating & Wire Co.	lviii
Fisons Pest Control Ltd.	xxxiii
Soc. Fives Lille—Cail	viii
George Fletcher & Co. Ltd.	Outside Back Cover
Fontaine & Co.	lvi
Goka N.V.	lviii
E. Green & Son Ltd.	xliii
Gruendler Crusher & Pulveriser Co.	ix
N. A. Helmer	lvi
Fr. Hesser Maschinenfabrik A.G.	xvi
Honolulu Iron Works Co.	xxi
Invest-Export	xviii

	PAGE
Johns-Manville International Corp.	li
John King & Co. (Leeds) Ltd.	lx
Kingston Industrial Works Ltd.	xx
Kleen-e-zee Brush Co. Ltd.	liii
Lea Recorder Co. Ltd.	lii
Link-Belt Co.	xvii
E. C. Masson	lvi
Mechans Ltd.	xii
Mirrlees Watson Co. Ltd.	Inside Front Cover, iii
Norit	xlvii
Paterson Engineering Co. Ltd.	xlix
Pennine Chainbelt Co. Ltd.	lii
Pott, Cassels & Williamson Ltd.	xxxviii
Ransomes, Sims & Jefferies Ltd.	xiv
Renold Chains Ltd.	xix
Rotameter Mfg. Co. Ltd.	xxii
Sackfilling & Sewing Machine Syndicate Ltd.	iv
Salzgitter Industriebau G.m.b.H.	v
Salzgitter Maschinen A.G.	xxvi
Sandvik Steel Band Conveyors Ltd.	xxiv
Richard Simon & Sons Ltd.	lxi
G. & A. E. Slingsby Ltd.	liv
A. & W. Smith & Co. Ltd.	xxxvi, xxxvii
S.P.E.I. Chim.	liv
Spencer (Melksham) Ltd.	xxvii
Duncan Stewart & Co. Ltd.	xli
Stork-Werkspoor N.V.	xi, lvii
Strachan & Henshaw Ltd.	xxviii
Suchar Sales Corporation	xlii
Sugar Manufacturers' Supply Co. Ltd.	xliv
Technoexport Ltd.	xxiii
John Thompson Water Tube Boilers Ltd.	xxix
Watson Laidlaw & Co. Ltd.	xxxii
Western States Machine Co.	lv
Yorkshire Imperial Metals Ltd.	xv

FOR BUYERS' GUIDE SEE JULY ISSUE pp. xliii-lvii

SMALL ADVERTISEMENT RATES

Forty words or under—£1. 10s. 0d. sterling or U.S. $4.00 prepaid. Each additional six words or part thereof—5s. 0d. or U.S. $0.75. Box Numbers—charged as six words.

FONTAINE
Serving the Sugar Industry for more than 100 Years
Perforated Sheets of all Types
Speciality: Small Perforations
FONTAINE & CO. GMBH. · AACHEN W.-GERMANY

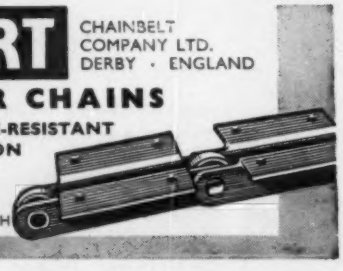
E. C. MASSON Member A.S.M.E. CONSULTING ENGINEER
CANE SUGAR MILLS & REFINERIES
Engineering & Construction — Improvements & Expansion
FACTORY AUTOMATION
P.O. Box 45-484 MIAMI 45, FLORIDA U.S.A. Telephone: Highland 3-3025
Cables: NOSSAM

N. A. HELMER
Member A.S.M.E.
CONSULTING ENGINEER
Representing
The Mirrlees Watson Company Limited, Glasgow, Scotland
Pott, Cassels & Williamson Limited, Motherwell, Scotland
POST OFFICE BOX 54—PLAINFIELD, N.J., U.S.A.

REQUIRED IMMEDIATELY. EXPERIENCED QUALIFIED CHEMIST. To be responsible from complete chemical control of Sugar Factory and Laboratory. Apply: Manager, Hampden Estates Ltd., Hampden P.O., Jamaica, W.I.

GRADUATE of Dutch Agricultural University, married, two children, seeks post in America, Canada, Brazil or European Sugar Factory. Plan Asaian, Dj. Sumbing, F. Mslang, Java, Indonesia.

EWART CHAINBELT COMPANY LTD. DERBY · ENGLAND
CARRIER CHAINS
IN CORROSION-RESISTANT MALLEABLE IRON
STEEL CHAINS UP TO 140,000 LB. BREAKING STRENGTH



BIG BEND FACTORY, SWAZILAND

M. Sc. (Agric.), experienced over 20 years in sugar cane cultivation in all its aspects. Worked in various capacities in large factory owned sugar plantations. Seeks a suitable post as Plantation Manager. Write Box No. 420, *The International Sugar Journal Ltd.*

AGRONOMIST, M.Sc. in Tropical Agriculture, with seven years' research experience on a very large sugar estate seeks position in the sugar industry. Write Box. No. 422, *The International Sugar Journal Ltd.*

FOR SALE—Bound volumes of *The International Sugar Journal* 1932 to 1954 inclusive, also single copies 1955 and 1956 complete. All in excellent condition. Offers to Box No. 421, *The International Sugar Journal Ltd.*

BASIC CALCULATIONS FOR THE CANE SUGAR FACTORY

By J. EISNER

Price : **7s. 6d. ($1·00 U.S.)**

Obtainable from the **I.S.J. Books Dept., Central Chambers, The Broadway, London, W.5**

"Brasil Açucareiro"

OFFICIAL ORGAN *of the* BRAZILIAN INSTITUTE OF SUGAR & ALCOHOL
(INSTITUTO DO AÇÚCAR E DO ÁLCOOL)

A MONTHLY MAGAZINE containing complete news and specialized contributions on Brazilian and international sugar agriculture and industry.

Annual Subscription:

Brazil	Cr.$100.00
Foreign Countries	Cr.$150.00
Single Copies	Cr. $10.00
Back Copies	Cr. $15.00

Remittances must be made in the name of

INSTITUTO DO AÇÚCAR E DO ÁLCOOL
Praça 15 de Novembro, 42,
Rio de Janeiro,
BRASIL.
Caixa Postal 420.

STORK

Koninklijke
Machinefabriek
Gebr. Stork & Co. N.V.
Hengelo (Ov.)
Holland

One of our associates requires

CHIEF ENGINEERS

and

CHIEF CHEMISTS

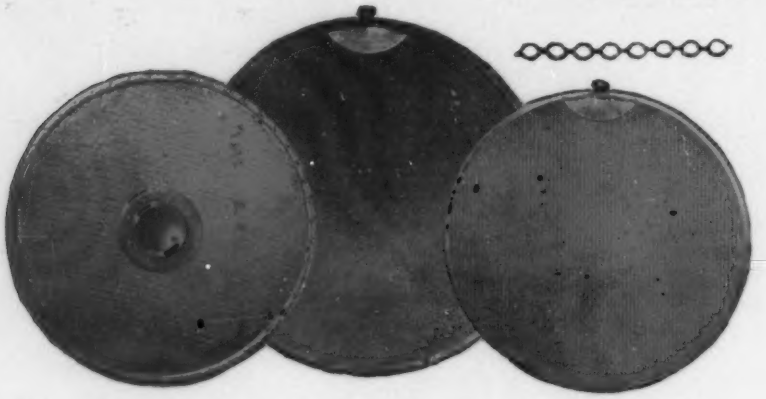
with 15 to 20 years' experience for sugar factories in East Pakistan.

Please apply to Koninklijke Machinefabriek Gebr. Stork & Co. N.V. Hengelo (Ov.) Holland and state full particulars.

FILTER LEAVES—

WE SPECIALIZE IN ALL TYPES

Tubular Slit



Type 316. Stainless Leaf for Vallez Filter

5-Mesh .080 Stainless

Tubular Slit Stainless Leaf for Sweetland Filters. *Thousands in use.*

Write for our New Catalog

FERGUSON PERFORATING & WIRE CO.

130-140 ERNEST STREET **PROVIDENCE 5, R.I.**

We have sold our patented

SUGAR TABLET OR CUBE INSTALLATIONS

all over the world.

Cubes from dry granulated

The small machine with the big output!

Automatic packing equipment if desired

Very low capital outlay

Send for information to:

GOKA N.V.
MACHINE WORKS

Established 21 years
AMSTERDAM
HOLLAND
P.O. Box No. 130
Tel: 222255–222256
Telex: 14173 "Kagodam"
Cables "Kagodam"

CUBA SUGAR YEAR BOOK

New Edition (Spanish-English containing **SUGAR CENSUS** corrected to date, informative data and alphabetical index of Sugar Mills, giving situation, ownership, year founded, nationality, characteristics, total employees, yield (%), total cane ground, production and export of sugar, molasses, syrups, alcohol, cane brandy, aguardiente, rum.

Also lands owned and leased, colonos, days grinding, record and maps of rainfall, price of sugar and value of crops. Maps of Cuba showing ports, landings, distances, railways, roads, air communications, telegraph, cable and telephone connexions. Graphs with cane and cane products data. Bonded warehouses, taxes, and legislative measures enacted touching the industry.

Directories with over 3000 names and addresses of official and private organizations, business firms, cane growers (Colonos), department heads, producers, shippers, etc.

Foreign Section : Sugar production in U.S. and other countries (beet and cane). Imports and distribution of sugar and by-products in U.S. World demand and consumption, quotas, distribution, transport, etc.

$5 post paid

Edited by:

CUBA ECONOMICA Y FINANCIERA

POST OFFICE BOX 2549, HAVANA, CUBA

Teleph. M-3148 Lonja 441-442

GUARANTEED

MACHINE TOOLS

FROM OUR LONDON STOCKS

★ NOBLE & LUND, 20 in./22 in. Fluifeed Cold Sawing Machine. Four cutting speeds, 30 to 91 f.p.m. Capacity when fitted with 22 in. blade–7½ in. rounds; 6¾ in. squares; 14 in. × 6 in. R.S.J. With hydraulically operated vice, coolant pump. Motor drive 400/3/50.

★ KEARNS No. 1. Horizontal Boring Machine. 2½ in. dia. traversing spindle. Bored No. 5 Morse Taper. With automatic facing head. Main table 24 in. × 36 in. Square revolving table–24 in. × 24 in. 12 spindle speeds. Max. distance facing slide to boring stay 48 in. dia. Power feeds to all movements. Motor drive 400/3/50.

★ ARCHDALE 3 ft. 6 in. Radial Drilling Machine, low base with elevating arm. Spindle bored No. 4 M.T. Twelve spindle speeds 80 to 2,000 r.p.m. forward and reverse. Working surface of base 37 in. × 30 in. Max. distance spindle to base 54 in. With loose box table 26½ in. × 20 in. × 20½ in. high. Motor drive to head and elevating arm 400/3/50.

★ MASSEY 5 cwt. (with slides ty[illegible]) Pneumatic Power Hammer. Column to centre line of pallet face 18 in. Tup pallet face 10 in. × 6 in. Anvil face 14 in. × 6 in. 140 strokes per min. With side lever and foot control. Motor drive 400/3/50.

★ KELLY Crank Shaping Machine. Length of stroke 28 in. Eight speeds to ram 11 to 84 s.p.m. Working surface of box table 15¾ in. × 28 in. Motor drive 415/3/50.

★ LANG 14 in. S.S. & S.C. Straight Bed Centre Lathe. Admits 7 ft. 10 in. between centres. Hollow spindle bored 3¼ in. Twelve spindle speeds 6.5 to 330 r.p.m. Fitted with taper turning attachment. Motor drive 400–440/3/50.

★ KITCHEN & WADE 4 ft. Low Base Radial Drilling Machine, with power elevation to the arm. Spindle bored No. 4. Morse Taper. Nine spindle speeds 40 to 800 r.p.m. Working surface of base 45 in. × 39 in. Max. distance spindle to base 4 ft. 4 in. With loose box table 24 in. × 22 in. × 22 in. Motor drive 400/3/50.

★ DENBIGH Model C.4. Semi-Universal Milling Machine. Working surface of swivelling table 40½ in. × 10 in. Nine spindle speeds 13 to 400 r.p.m. Power feed to longitudinal movement. Motor drive 400/3/50.

★ JONES & SHIPMAN Universal Grinding Machine. Capacity 10 in. × 27 in. Eight table traverse speeds 3 in. to 57 in. per min. Four speeds to swivelling workhead. Max. grinding wheel size 8 in. dia. With rear mounted internal grinding attachment and motorised coolant pump. Motor drive to workhead, wheelhead and table 400–440/3/50.

These are representative items from our wide range of new and reconditioned Plant. Comprehensive stocks also include:

Power Plant, Hydraulic Plant, Process Plant, Contractors' Plant, Lifting and Mechanical Handling Equipment.

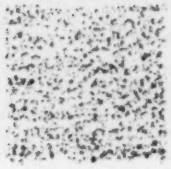
May we put you on our mailing list?

GEORGE COHEN
SONS & COMPANY LTD
ESTABLISHED 1834
LONDON, W.12 Cables: OMNIPLANT, TELEX, LONDON
600 GROUP

is yours a

DECOLOURISING

problem



. . specify

ACTIBON

THE HIGHLY ACTIVATED DECOLOURISING CARBON

IT'S CRYSTAL CLEAR

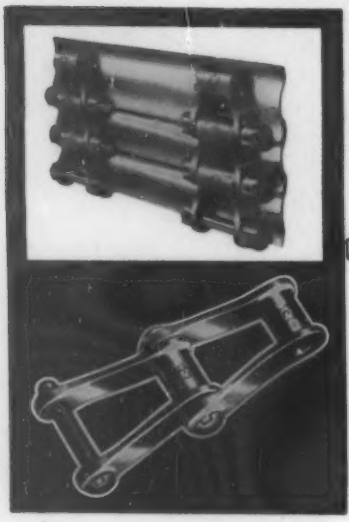
THE CLYDESDALE CHEMICAL CO., LTD.

SALES OFFICE
142 QUEEN STREET, GLASGOW, C.1.
Phone: **Central 5247-8** *Grams:* **"Cactus" Glasgow**

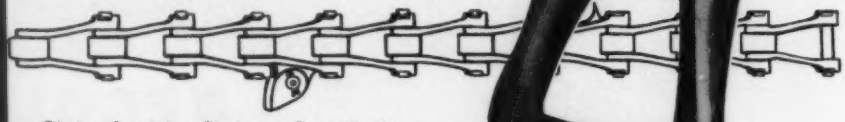
Equipment Specialists for Sugar Mills

JOHN KING of LEEDS

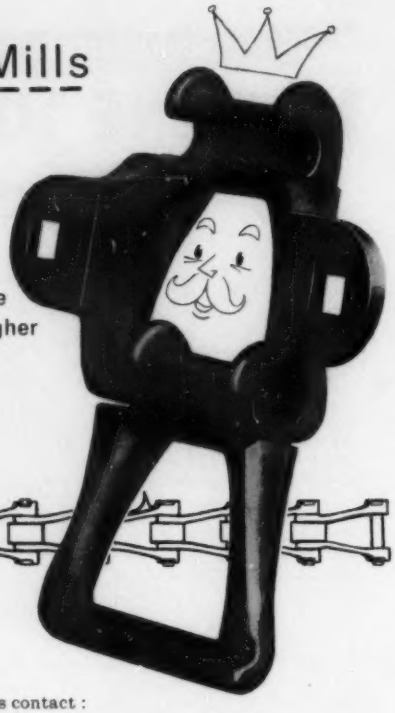
'Climax' malleable iron has greater comparative resistance to sugar acid corrosion, whilst our special 'Klimal' metal combines this important feature with longer wearing and higher anti-shock qualities.



CARRIER SLATS – *Standard sizes and shapes available for all sugar carrier chains. Close working faces prevent material jamming between slats.*



Chains for Juice Strainers, Cane Feeding Tables, etc., etc.



For details regarding any equipment or information about any special problems contact :

JOHN KING & CO. (LEEDS) LTD. GARNET ROAD, LEEDS 11

Phone: 75414 (4 lines) Grams: Malleable Leeds 11

We con supply Elevators · Conveyors · Hoppers · Bunkers and Buckets of all types

THE SOUTH AFRICAN SUGAR JOURNAL

covering the

Sugar Industries of NATAL, ZULULAND, MOZAMBIQUE and EAST AFRICA

Since 1914

The *South African Sugar Journal* has presented planters and millers in the territories for which it caters with authoritative reviews of developments in all fields of sugar cane technology.

FREE SAMPLE COPY SENT ON REQUEST

Subscription and Advertising Rates available from

THE SOUTH AFRICAN SUGAR JOURNAL

P.O. Box 1209

London Assurance House, Smith Street, Durban, South Africa.

Telephone 25612

SUGAR NEWS

A MONTHLY JOURNAL DEVOTED TO THE INTERESTS OF THE PHILIPPINE SUGAR INDUSTRY

Published by:

THE SUGAR NEWS PRESS INC.

FEATURES

Results of research and experiments in fields and mills, and other important developments in the Philippine sugar industry of interest both to technical men and laymen ; sugar production, prices, and market news and statistics ; write-ups on other important and allied industries in the Philippines, etc.

SUBSCRIPTION

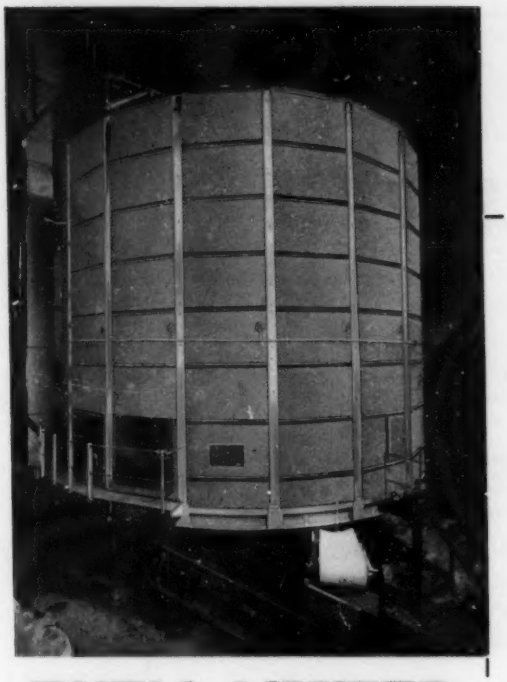
$7.50 U.S. Currency, per annum, post free *for U.S.A. and its possessions*

$10.00 U.S. Currency, per annum, post free *for other foreign countries*

WRITE FOR A FREE SPECIMEN COPY AND FOR ADVERTISING RATES.

Publishing Office:

417 Dasmariñas, 316 Doña Salud Building, Manila, Philippines.



BUELL

Trade Mark

"TURBO" TRAY DRYER-COOLERS

Operating on the original "Büttner" system these machines carry the sugar crystals in a shallow bed on superimposed annular shelves exposing a large and frequently changing surface to the drying or cooling air. Restricted movement and absence of tumbling action at the critical stages avoids degradation, preserves the brilliance of the crystal faces and reduces dust emission.

Latest designs incorporate anti-agglomerating pre-Dryer for very fine grain sugar and use heat exchangers passing clean filtered air only.

Illustration shows Buell combined Drying and Cooling unit handling 18 tons white sugar per hour in a British Sugar Factory.

Also

BUELL-BÜTTNER ROTARY DRUM DRYERS FOR DRYING BEET SUGAR PULP

B6

BUELL LIMITED

(a subsidiary of Edgar Allen & Co. Limited)

THREE ST. JAMES'S SQUARE · LONDON S.W.1

Telegrams: Allentare Piccy, London.

Telephone: Trafalgar 2528 (3 lines).

CONTINUOUS BELT WEIGHER

for weighing whole beets or cossettes

Specially adapted for controlling the speed of cutting mills relative to weight for Continuous Diffusion Plants

Automatic and Sackfilling Weighing Machines

SPECIAL TYPES IN CONSTANT PRODUCTION for

- **RAW SUGAR**
- **REFINED SUGAR**
- **and BEET PULP**

RICHARD SIMON & SONS LTD.

PHOENIX WORKS, BASFORD, NOTTINGHAM

Telephone: 75136-7-8 *Telegrams:* "Balance, Nottingham"

K/RS 21

I.S.J.

SUGAR BOOK DEPARTMENT

All books reviewed in this *Journal* may be obtained through our Sugar Book Department. Where no inclusive price is quoted in our review, 2s. 6d. should be added to cover the cost of packing and postage.

★ *Check your personal library against the list of basic books given below :*

		POST PAID
BASIC CALCULATIONS FOR THE CANE SUGAR FACTORY: *Eisner*	(1958)	**7s. 6d.**
PRINCIPLES OF CANE SUGAR MANUFACTURE : *Davies*	(1938)	**22s. 6d.**
CANE SUGAR AND ITS MANUFACTURE : *Geerligs* ...	(1924)	**32s. 6d.**
CANE SUGAR HANDBOOK (8th ed.) : *Spencer and Meade*	(1945)	**134s. 6d.**
SUGAR ANALYSIS (3rd ed.) : *Browne and Zerban*	(1941)	**183s. 6d.**
BEET SUGAR ECONOMICS : *Cottrell*	(1952)	**42s. 6d.**
SUGAR YEAR BOOK : *Int. Sugar Council*	(1958)	**11s. 0d.**
SUCRERIE DE BETTERAVES : *Dubourg*	(1952)	**62s. 6d.**
PRINCIPLES OF SUGAR TECHNOLOGY (Vol. I) : *Honig*	(1953)	**97s. 6d.**
(Vol. II): *Honig*	(1959)	**97s. 6d.**
TECHNOLOGY FOR SUGAR REFINERY WORKERS (3rd ed.): *Lyle*		**72s. 6d.**
LIGHT'S INTERNATIONAL SUGAR ECONOMIC YEAR-BOOK & DIRECTORY	(1959-60)	**55s. 6d.**
SYSTEM OF CANE SUGAR FACTORY CONTROL (2nd ed.): *International Society of Sugar Cane Technologists*	(1956)	**13s. 9d.**
HANDBOOK OF CANE SUGAR ENGINEERING. *Hugot*, translated by *Jenkins*	(1960)	**172s. 6d**

The above prices include postage and packing.

Terms are strictly cash in advance.

Our Bankers are : Barclays Bank Ltd., 3 Great Tower Street, London, E.C.3.

SUGAR BOOK DEPARTMENT, International Sugar Journal, Ltd.

Central Chambers, The Broadway, London, W.5.

Khuzestan

KHUZESTAN FACTORY, IRAN, INSTALLS DORR-OLIVER EQUIPMENT. DORR-OLIVER, N. V. HOLLAND, COOPERATING WITH STORK-WERKSPOOR, CONTRACTOR, FURNISHES 2 RAPIDORR CLARIFIERS, 3 OLIVER-CAMPBELL FILTERS.

These are the world-wide facilities of the Dorr-Oliver organization:

Dorr-Oliver Companies
Australia, Belgium, Canada, France, Germany, Great Britain, India, Italy, Netherlands, United States

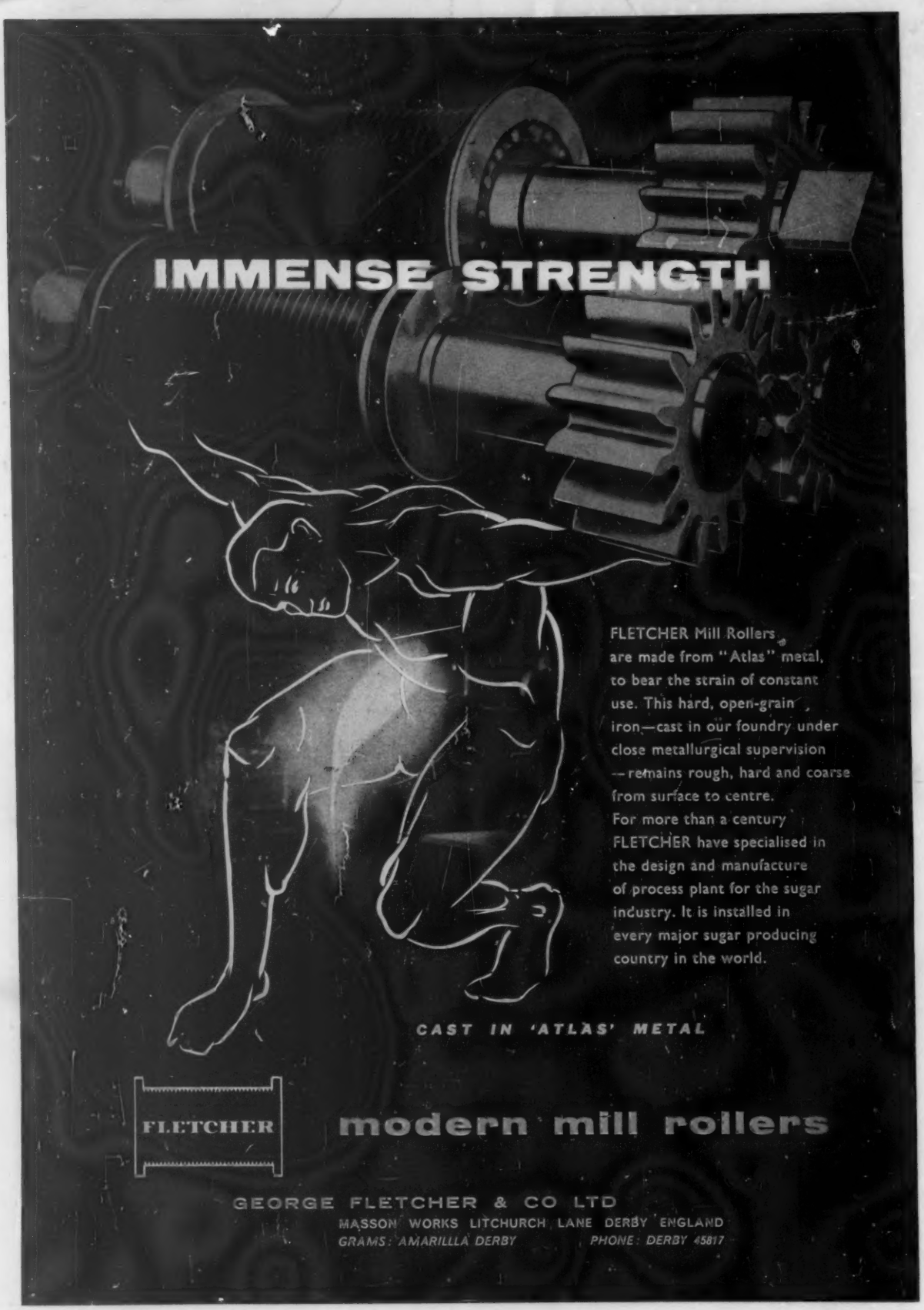
Dorr-Oliver Representatives
Argentina, Brazil, British Guiana, Colombia, Costa Rica, Cuba, Hawaii, Jamaica, Japan, Mauritius, Mexico, Philippines, Portugal, Puerto Rico, Reunion, South Africa, Spain, Venezuela

Write to Dorr-Oliver, Stamford, Conn. for the name of your nearest representative.

Available Universally . . . . . DORR-OLIVER SUGAR PROCESSING EQUIPMENT

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT


IMMENSE STRENGTH
FLETCHER Mill Rollers are made from "Atlas" metal, to bear the strain of constant use. This hard, open-grain iron—cast in our foundry under close metallurgical supervision —remains rough, hard and coarse from surface to centre.
For more than a century FLETCHER have specialised in the design and manufacture of process plant for the sugar industry. It is installed in every major sugar producing country in the world.
CAST IN 'ATLAS' METAL
FLETCHER
modern mill rollers
GEORGE FLETCHER & CO LTD
MASSON WORKS LITCHURCH LANE DERBY ENGLAND
GRAMS: AMARILLLA DERBY
PHONE: DERBY 45817

Printed by JOHN ROBERTS & SONS, Salford, Manchester; and published by the Proprietors THE INTERNATIONAL SUGAR JOURNAL LTD., at Central Chambers, The Broadway, London, W.5. Entered at the New York Post Office as Second-Class Matter. Registered for transmission by Canadian Magazine Post

PRINTED IN GREAT BRITAIN.